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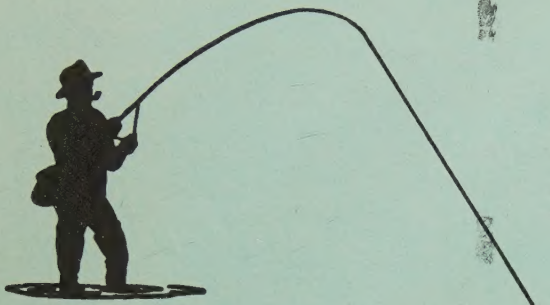

SPORT FISHERY ABSTRACTS

Vol. 22, No. 1, 1977

DEPARTMENT OF THE INTERIOR

U. S. FISH AND WILDLIFE SERVICE

UNITED STATES DEPARTMENT OF THE INTERIOR
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SPORT FISHERY ABSTRACTS

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Sport Fishery Abstracts is intended to furnish fishery biologists with abstracts of current literature in sport fishery research and management.

One volume, consisting of four numbers, is issued each year. Each number contains separate Author, Geographic, and Taxonomic indexes, and the final number of each volume contains cumulative Author, Geographic, Taxonomic, and Subject indexes, and a list of publications screened. Authors who publish in journals not screened for *Sport Fishery Abstracts*, and who would like their publications included, should submit abstracts to the Editor.

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SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

Volume 22 Number 1 1977

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Use of funds for printing this publication approved by the Director of the Office of Management and Budget, March 3, 1976.

GENERAL FISH CULTURE

77-000001 Lewis, W. M.; Buynak, G. L. EVALUATION OF A REVOLVING PLATE TYPE BIOFILTER FOR USE IN RECIRCULATED FISH PRODUCTION AND HOLDING UNITS. Trans. Am. Fish. Soc. 105 (6): 704-708. Nov. 1976. SFA 22(1)

[Dep. Zool., South. Ill. Univ., Carbondale 62901] Based on information gained from a pilot model, two identical revolving plate filters were designed to be evaluated for use in a recirculated fish production system. Each unit consisted of a fiberglass tank containing 787 liters of water; a biofilter having 60 plates, each 51 cm in diameter, rotated at 6 rpm; and a settling tank. The total water volume in each unit was 1,132 liters. Water was continuously passed through the filter at a rate of 9 liters/min, and fresh water was added to the fish tank at a rate of 0.45 to 0.72 liters/min. In a trial designed to determine loading rate, it was found that each of the units could support at least 45 g of channel catfish (/Ictalurus punctatus/) per liter of the total volume of water in the system, and approximately 2 kg/m^2 of surface area of the filter. By extrapolation, carrying capacity on the basis of fresh-water flush was 71 to 113 kg/liter/min. In a growth trial, the fish in both units grew at an acceptable rate for the temperature at which they were held. In both trials, ammonia, nitrite nitrogen, nitrate nitrogen, methyl orange alkalinity, pH, and oxygen remained at desirable levels. It appears that this type of filter has some features that are particularly attractive for use in recirculated fish production units or holding facilities.

77-000002 Vondruska, J. AQUACULTURAL ECONOMICS BIBLIOGRAPHY. NOAA Tech. Rep. NMFS SSRF- 703. 123p. Oct. 1976. SFA 22(1)

[NMFS, Econ. Marketing Res. Div., NOAA, Washington, DC 20235] This aquacultural economics bibliography includes recent published and some unpublished United States and foreign literature (originally in or translated into English). Based upon U.S. aquacultural activity and interests, the 262 entries are listed alphabetically within eight categories: catfish, trout, salmon, oysters and other mollusks, shrimp, and other crustaceans, other animal species, seaweeds, and general. Included literature concerns production economics, methodology, demand, supply, markets and marketing, institutions, constraints, state of the art, investment analysis, data, and other subjects. Some entries are general, or primarily descriptive, or of primarily non-economic content.

TROUT AND SALMON CULTURE

77-000003 Balderston, W. L.; Sieburth, J. McN. NITRATE REMOVAL IN CLOSED-SYSTEM AQUACULTURE BY COLUMNAR DENITRIFICATION. Appl. Environ. Microbiol. 32 (6): 808-818. Dec. 1976. SFA 22(1)

[Chemiclene Corp., Box 26, R.D. 1, Malvern, PA 19355] The columnar denitrification method of nitrate-Nitrogen removal from high-density, closed system, salmonid aquaculture was investigated and found to be feasible. However, adequate chemical monitoring was found to be necessary for the optimization and quality control of this method. When methanol-carbon was not balanced with inlet nitrate-nitrogen, the column effluent became unsatisfactory for closed-system fish culture due to the presence of excess amounts of nitrite, ammonia, sulfide, and dissolved organic carbon. Sulfide production was also influenced by column maturity and residence time. Methane-carbon was found to be unsatisfactory as an exogenous carbon source. Endogenous carbon could not support high removal efficiencies. Freshwater columns adapted readily to an artificial seawater with a salinity of 18°/oo without observable inhibition. Scanning electron microscopy revealed that the bacterial flora was mainly rod forms with the Peritricha (Protozoa) dominating as the primary consumers. Denitrifying bacteria isolated from freshwater columns were tentatively identified as species of /Pseudomonas/ and /Alcaligenes/. A pilot plant column was found to behave in a manner similar to the laboratory columns except that nitrite production was never observed.

77-000004 Crim, L. W.; Evans, D. M. GONADOTROPIC HORMONE TREATMENT OF RAINBOW TROUT (/SALMO GAIRDNERI/): PLASMA HORMONE PROFILE FOLLOWING A SINGLE INJECTION. J. Fish. Res. Board Can. 33 (12): 2841-2844. Dec. 1976. In English with French summ. SFA 22(1)

[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF, Canada] Immature rainbow trout (/Salmo gairdneri/) were treated with salmon gonadotropic hormone to determine the presence of this hormone in circulation, to describe the plasma profile with time after exogenous hormone treatment, and to determine the difference in plasma gonadotropin levels resulting from treatment with two different hormone doses. The effect of three selected temperatures on the plasma hormone profile was also studied. The plasma concentration of the injected hormone following a low dose (0.02 ug/g) and a high dose (0.2 ug/g) suggested that plasma hormone levels were directly related to the hormone quantity injected. For fish maintained at 6 C, plasma gonadotropin values declined over a period of 7 days reaching low but detectable levels. Lower plasma gonadotropin profiles were observed for fish held at 6 and 15 compared with fish at 2 C ambient temperature. These data suggest the plasma gonadotropin levels and ambient temperature are related in an inverse manner.

77-000005 Wedemeyer, G. A. PHYSIOLOGICAL RESPONSE OF JUVENILE COHO SALMON (/ONCORHYNCHUS KISUTCH/) AND RAINBOW TROUT (/SALMO GAIRDNERI/) TO HANDLING AND CROWDING STRESS IN INTENSIVE FISH CULTURE. J. Fish. Res. Board Can. 33 (12): 2699-2702. Dec. 1976. In English with French summ. SFA 22(1)

[U.S. FWS, West. Fish Dis. Lab., Naval Support Activity, Seattle, WA 98115] Moving 4-5-in. coho salmon (/Oncorhynchus kisutch/) held in soft (20 ppm CaCO(3)) water from the relatively light loading density of 0.5 lb/ft^3 to 1, 2, or 4 lb/ft^3 (density index, DI = 0.1, 0.2, 0.4, 0.8) caused significant stress as indicated by loss of feeding behavior, but only minimal physiological disturbances, as indicated by lack of hyperglycemia or hypochloremia. However, moving them to 6 or

77-000005 CONTINUED
12 lb/ft³ (DI = 1.2, 2.4) caused significant physiological stress by population densities of 1 lb/ft³ or more and a subclinical corynebacterial kidney infection was activated. Rainbow trout (/Salmo gairdneri/) (4-5 in.) were physiologically stressed when moved and held at 1 lb/ft³ or more but retained normal feeding behavior. This indicates that handling and crowding stress will be minimized in softwater areas if densities in fish distribution trucks or in ponds or raceways during disease treatments are held to 0.1-0.5 lb/gal.

WARMWATER CULTURE

77-000006 Faruqui, A. M. FLUCTUATION IN OXYGEN CONCENTRATION AND OCCURRENCE OF MORTALITY OF CARP HATCHLINGS IN A HATCHERY POND AT PARTA FISH FARM, BHOPAL. Broteria Ser. Trimest. Cienc. Nat. 44 (1-2): 67-79. 1975. SFA 22(1)
[Fish. Res. Lab., Patra Fish Farm, Bhopal, India] Fluctuation in dissolved oxygen concentration and occurrence of spontaneous mortality of carp hatchlings in a hatchery pond at Patra fish farm, Bhopal was observed in the present study. The mortality was observed at high level concentration of oxygen, the first mortality at 18 mg/l on 12.7.73, the second mortality at 19.2 mg/l on 11.8.73 and a third mortality at 19.6 mg/l on 13.8.73. The concentration of 18 mg/l and above is found lethal to the carp hatchlings. The increase in oxygen level is, however, attributed to the absorption of atmospheric oxygen by the exposed surface of the hatchery water and its diffusion when the depth is only 25 cms. combined with turbulence caused due to wind action. The maximum oxygen has been observed in the after noon and the minimum in the shallow waters (25 cms.) at 24 hours whereas in deep waters it is between 2 to 6 hours (before dawn). The dissolved oxygen is not controlled by the temperature.--Summ.

77-000007 Grover, J. H.; Banacia, G. T. PRELIMINARY YIELD TRIAL WITH CARP POLYCULTURE IN FERTILIZED AND UNFERTILIZED PONDS. Philipp. J. Fish. 11 (1-2): 17-22. 973. SFA 22(1)
[Freshwater Aquacult. Cent., Central Luzon State Univ., Munoz, Nueva Ecija, 2320, Philippines]

77-000008 Grover, J. H. PRODUCTION OF MILKFISH IN COMBINATION WITH COMMON CARP AND THAI CATFISH IN FERTILIZED FRESHWATER PONDS. Philipp. J. Fish. 11 (1-2): 1-16. 1973. SFA 22(1)
[Freshwater Aquacult. Cent., Central Luzon State Univ., Munoz, Nueva Ecija, 2320, Philippines]

77-000009 Guerrero, R. D. III CULTURE OF MONOSEX MALE /TILAPIA MOSSAMBICA/ AND /OPHICEPHALUS STRIATUS/ IN FERTILIZED PONDS WITH SUPPLEMENTARY FEEDING. Philipp. J. Fish. 12 (1-2): 64-74. 1974. SFA 22(1)
[Freshwater Aquacult. Cent., Central Luzon State Univ., Munoz, Nueva Ecija 2320, Philippines] Two ponds were each stocked with male /Tilipia mossambica/ postfingerlings and /Ophicephalus striatus/ fry at 10,000/ha and 400/ha, respectively. Growth rate of male tilapia in monosex culture was highest during the second month of the 120-day culture period. An estimated average standing crop of 5,076 kg/ha/yr for harvestable-sized tilapia with 93 percent recovery was calculated. Average yield and recovery for O. striatus/ were 20 kg/ha, and 33 percent. Fifteen females were recovered from each pond. The small number of tilapia reproduction was attributed to /O. striatus/

77-000009 CONTINUED
predation.

77-000010 Lam, T. J.; Pandey, S.; Hoar, W. S. INDUCTION OF OVULATION IN GOLDFISH BY SYNTHETIC LUTEINIZING HORMONE-RELEASING HORMONE (LH-RH). Can. J. Zool. 53 (8): 1189-1192. Aug. 1975. In English with French summ. SFA 22(1)
[Dep. Zool., Univ. Singapore, Singapore 10] Synthetic luteinizing hormone-releasing hormone was found to be effective in inducing ovulation in goldfish after three daily injections of 2 ug/g intracranially or of 10 ug/g intraperitoneally.

77-000011 Sanico, A. F. EFFECTS OF 17A-ETHYNYLTESTOSTERONE AND ESTRONE ON SEX RATIO AND GROWTH OF /TILAPIA AUREA/ (STEINDACHNER). Philipp. J. Fish. 13 (1): 1-17. 1975. SFA 22(1)
/Tilapia aurea/ (Steindachner) were fed androgen (17a -ethynyltestosterone) or estrogen (estrone) at 30 ug/gm or 100 ug/gm of diet, respectively, for 22 days in steel troughs. Daily feeding was Purina Trout Chow, 12 percent of body weight divided into three equal portions. Untreated Purina Trout Chow at 10 percent of body weight was fed in rearing trials in both concrete tanks and earthen ponds once a day, six days a week. One hundred percent males were produced with the androgen in Trial I and 90.3 percent males in Trial II. Estrogen did not produce a significant effect on sex ratio. Fish treated with androgen had significantly (P less than 0.05) greater weight at four months of age, after having been reared in earthen ponds. There was no significant difference (P less than 0.05) in weight when the fish were sampled at 2 months of age. Estrogen at the dosage level of 100 ug/gm of diet had no effect on sex ratio in /T. aurea/.

77-000012 Waltemyer, D. L. TANNIN AS AN AGENT TO ELIMINATE ADHESIVENESS OF WALLEYE EGGS DURING ARTIFICIAL PROPAGATION. Trans. Am. Fish. Soc. 105 (6): 731-736. Nov. 1976. SFA 22(1)
[Alaska Dep. Fish Game, Comm. Fish. Div., 333 Raspberry Rd., Anchorage 99502] Tannin has been used to decrease adhesiveness of walleye (/Stizostedion vetreum/) eggs for the purpose of shortening the water-hardening phase of walleye propagation. In this study, adhesiveness of fertilized walleye eggs decreased after exposure to tannin concentrations between 200 and 1,000 mg/liter. Reduction in adhesiveness was generally proportional to tannin concentrations by exposure time. Adhesiveness was further reduced and eliminated in higher tannin concentrations by stirring the eggs during a 2-minute exposure. Hatching success of nontreated (control) eggs averaged 37 and 47 percent whereas hatching success of tannin-treated eggs averaged 38 and 50 percent for 1974 and 1975, respecitvely. A 2-minute exposure at tannin concentrations ranging from 400 to 1,000 mg/liter would expedite artificial propagation and could enhance egg survival.

MARICULTURE

77-000013 Rosario, W. M. OBSERVATION ON THE RATE OF GROWTH OF SIGANID FRY "PADAS" CONFINED IN CONCRET TANKS. Philipp. J. Fish. 12 (1-2): 55-63. 1974. SFA 22(1)
[Bur. Fish. Aquatic Resour., Dagupan City, Philippines]

FEEDS, FEEDING AND NUTRITION

77-000014 Cowey, C. B.; Adron, J. W.; Owen, J. M.; Roberts, R. J. THE EFFECT OF DIFFERENT DIETARY OILS ON TISSUE FATTY ACIDS AND TISSUE PATHOLOGY IN TURBOT /SCOPHTHALMUS MAXIMUS/. Comp. Biochem. Physiol. B Comp. Biochem. 53 (3): 399-403. 1976. SFA 22(1)
[Inst. Mar. Biochem., St. Fittick's Rd., Aberdeen AB1 3RA Scotland]

77-000015 de la Higuera, M.; Murillo, A.; Varela, G.; Zamora, S. THE INFLUENCE OF HIGH DIETARY FAT LEVELS ON PROTEIN UTILIZATION BY THE TROUT, (/SALMO GAIRDNERI/). Comp. Biochem. Physiol. A Comp. Physiol. 56 (1): 37-41. 1977. SFA 22(1)
[Dep. Anim. Physiol., Univ. Granada, Spain] The effect of total dietary energy content on protein utilization and on the levels of certain liver enzymes in trout was examined. Groups of trout or individual trout were fed a commercial diet to which different additional amounts of olive oil had been added. Fat digestibility was not affected by fat content in the diet. Dietary lipid levels did not affect protein digestibility. Indices of protein utilization improved markedly as dietary lipid level was increased. The effect was shown by an increase in biological value and a significant increase of protein productive value. Glutamate-pyruvate transaminase activity decreased and glucose-6-phosphatase activity increased when trout were fed a high lipid diet. The activities of other liver enzymes was neither increased nor decreased by dietary changes involving increases in fat level.--From abstr.

77-000016 Kazlauskene, O. P.; Shcherbina, M. A. ALTERATION IN THE ORGANIC AND MINERAL COMPOSITION OF THE CHYME IN YEARLING POND CARP (/CYPRINUS CARPIO/) FOLLOWING THE ADDITION OF CHALK TO THE DIET. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 804-811. 1975. SFA 22(1)
[VNIIPRKh, Rybnoye Postal Dist., USSR] The article presents experimental data showing changes in the organic and mineral composition of the chyme in the course of the digestion of qualitatively different diets by yearling pond carp. The effect of the level of mineral calcium in the food on the chemical composition of the chyme is determined.

77-000017 Narayansingh, T.; Eales, J. G. THE INFLUENCE OF PHYSIOLOGICAL DOSES OF THYRONXINE ON THE LIPID RESERVES OF STARVED AND FED BROOK TROUT, /SALVELINUS FONTINALIS/ (MITCHILL). Comp. Biochem. Physiol. B Comp. Biochem. 52 (3): 407-412. Nov. 1975. SFA 22(1)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada] The effects of thyroxine (T(4)) on growth and lipid reserves were followed in brook trout, starved or fed 0.6 or 1.2 percent of their body weight per day. Nutritional state influenced growth, hepatosomatic index (HSI), viscerosomatic index (VSI) and the visceral lipid content, but had little effect on liver or muscle lipid. T(4) promoted growth in fed fish, decreased HSI of starved fish, tended to increase HSI in fed fish (1.2 percent ration), tended to lower hepatic and visceral lipid

77-000017 CONTINUED
reserves in both starved and fed fish, increased the free fatty acid level in visceral adipose tissue, but had little effect on muscle lipid. It is concluded that the growth promoting influence of T(4) is accompanied by a trend towards mobilization rather than deposition of fat.

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT

77-000018 Ondok, J. P. PHYTOPLANKTON PRODUCTION IN A EUTROPHIC FISHPOND. I. SHORTWAVE RADIATION REGIME IN THE WATER. Arch. Hydrobiol. Supplementb. 49 (3): 361-376. Oct. 1976. SFA 22(1)
[Dep. Hydrobiol., Inst. Bot., Czeck. Acad. Sci., Treton, Czechoslovakia]

CHEMICAL LIMNOLOGY AND OCEANOGRAPHY

77-000019 Schindler, D. W. EVOLUTION OF PHOSPHORUS LIMITATION IN LAKES. Science 195 (4275): 260-262. 21 Jan. 1977. SFA 22(1)
[Fish. Mar. Serv., Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada]

BENTHOS

77-000020 Brakke, D. F. MODIFICAITON OF THE WHITESIDE-WILLIAMS PATTERN SAMPLER. J. Fish. Res. Board Can. 33 (12): 2861-2863. Dec. 1976. In English with French summ. SFA 22(1)
[Dep. Zool., Ind. Univ., Bloomington 47401] The construction and operation of a modified pattern sampler for littoral microcrustaceans is described. The sampler is lightweight and inexpensive, yet produces quantitative information on populations and their spatial array. The composition of collections made by net and pattern samplers was not significantly different. The pattern sampler, however, offers several advantages.

PLANKTON

77-000021 Scientific Committee on Ocean Research; National Institute of Oceanography (CSIR) ABSTRACTS: SYMPOSIUM ON WARM WATER ZOOPLANKTON, 14-19 OCTOBER, 1976. N.I.O-GOA-INDIA. UNESCO [107p.] [Oct. 1976.] SFA 22(1)
[National Inst. Oceanogr., P.O. NIO-Donapaula, GOA, India]
Abstracts of 93 papers dealing with zooplankton worldwide.--RS

MORPHOLOGY

77-000022 Burton, D. THE INTEGUMENTARY MELANOPHORE PATTERNS OF TWO TELEOST SPECIES /GASTEROSTEUS ACULEATUS/ AND /PSEUDOPLEURONECTES AMERICANUS/. Can. J. Zool. 53 (5): 507-515. May 1975. In English with French summ. SFA 22(1)

[Mar. sci. Res. Lab., Memorial Univ., St. John's, NF A1C 5S7, Canada] /Gasterosteus aculeatus/ and /Pseudopleuronectes americanus/ possess distinctive melanophore-based patterns associated with marked differences in body form and their respective pelagic and benthic habitats. Both patterns are due, in part, to a combination of two morphologically distinct types of melanophores, and local variations in melanophore size and density and number of melanophore layers. On black-to-white background transfer both patterns have slow and rapid-paling components associated respectively with large and small melanophores of different densities.

77-000023 Desser, S. S.; Lester, R. AN ULTRASTRUCTURAL STUDY OF THE ENIGMATIC "RODLET CELLS" IN THE WHITE SUCKER, /CATOSTOMUS COMMERSONI/ (LACEPEDE) (PISCES: CATOSTOMIDAE). Can. J. Zool. 53 (11): 1483-1494. Nov. 1975. In English with French summ. SFA 22(1)

[Dep. Microbiol. Parasitol., Fac. Med., Univ. Toronto, Toronto M2S 1A1, Canada]

77-000024 Ellis, A. E. LEUCOCYTES AND RELATED CELLS IN THE PLAICE /PLEURONECTES PLATESSA/. J. Fish. Biol. 8 (2): 143-156. Feb. 1976. SFA 22(1)

[DAFS, Mar. Lab., Aberdeen, AB9 8DB, Scotland] The leucocytes and related cells of the blood of plaice were examined morphologically and their various functions assessed using a number of procedures to identify phagocytosis histochemical reactions and antibody responses. Four morphologically different types of thrombocytes were identified in addition to lymphocytes, plasma cells, monocytes, macrophages and one type of granulocyte which histochemically resembled the mammalian neutrophil. The evolution and development of the cells was also investigated and the various stages described.

77-000025 Ferguson, H. W. THE ULTRASTRUCTURE OF PLAICE (/PLEURONECTES PLATESSA/) LEUCOCYTES. J. Fish. Biol. 8 (2): 139-142. Feb. 1976. SFA 22(1)

[Unit Aquatic Pathobiol., Univ. Stirling, Stirling, Scotland] The leucocytes of plaice were examined and, at a morphological level, in addition to their response to the injection of carbon particles, They could be divided into four main types. Unlike previous reports, monocytes were seen. The neutrophil granules resembled the third granule type described in mammalian neutrophils. Monocytes and thrombocytes were the only cells to take up appreciable amounts of the carbon.

77-000026 Gorbunova, N. N.; Zvyagina, O. A. EGGS AND LARVAE OF THE SCALED SARDINE (/HARENGULA PENSACOLAE/) (PISCES, CLUPEIDAE). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 829-833. 1975. SFA 22(1)
[IOAN, Moscow, USSR]

77-000027 Hattingh, J. THE SURFACE AREA OF MUDFISH. J. Fish. Biol. 8 (1): 19-22. June 1976. SFA 22(1)
[Dep. Zool., Rand Afrikaans Univ., Johannesburg, South Africa] The surface area of two closely related mudfish species have been determined by coating the animals with masking tape. The results indicate that /Labeo capensis/ specimens above 95 g body weight have a larger surface area than coresponding /L. umbratus/ animals. The same is true for the fin surface area above 50 g body weight. Below these weights /L. umbratus/ specimens have higher surface areas. The body surface area of /L. capensis/ is always lower than that of /L. umbratus/ in the range studied.

77-000028 Henze, M.; Rempeters, G.; Anders, F. PTERIDINES IN THE SKIN OF XIPHOPHORINE FISH (/POECILIIDAE/). Comp. Biochem. Physiol. B Comp. Biochem. 56 (1): 35-46. 1977. SFA 22(1)
[Genet. Inst., Justus-Liebig Univ., Giessen, West Germany] A comparative study of substances fluorescing at 365 nm found in the skin and fins of Xiphophorine fish was carried out by means of thin-layer chromatography and fluorometry. Groups of single xanthophores, xanthoerythrophores and melanophores were examined by means of micro cellulose thin layers. Fifteen spots could be found in thin-layer chromatographs. Nine compounds were identified as pteridines, five remained unknown, but may also be pteridines while one is riboflavin. The macropterinophore pattern controlled by the locus /Dr/ (= dorsal red) and the macromelanophore pattern of /Sd/ (= spotted dorsal) were investigated with regard to their pteridine content in four purebred strains and six hybrid genotypes. While some genotypes contain only the colourless pteridines: isoxanthopterin, ranachrome-3 and biopterin ("limited" pattern); others additionally possess the coloured pteridines: neodrosopterin, drosopterin, isodrosopterin and sepiapterin ("complete" pattern). The amounts of pteridines found depend on both the types and the numbers of chromatophores.

77-000029 Hinton, D. E.; Pool, C. R. ULTRASTRUCTURE OF THE LIVER IN CHANNEL CATFISH /ICTALURUS PUNCTATUS/ (RAFINESQUE). J. Fish. Biol. 8 (3): 209-219. Mar. 1976. SFA 22(1)
[Dep. Pathol., Univ. Md., Sch. Med., 31 S. Greene St., Baltimore 21201] Livers of 38 channel catfish were studied by light and electron microscopy and the morphology of hepatocytes, endothelial cells, Kupffer cells, fat-storing cells, macrophages, exocrine pancreatic cells, and epithelium of bile pre-ductules and ducts was described. Hepatocytes contained large peri-canalicular bodies which showed acid hydrolase activity. A comparison between catfish liver and that of other teleosts was made. The applicability of the findings to pathobiological studies of teleost liver is described.

77-000030 Holeton, G. F. RESPIRATORY MORPHOMETRICS OF WHITE AND RED BLOODED ANTARCTIC FISH. Comp. Biochem. Physiol. A Comp. Physiol. 54 (2): 215-220. 1976. SFA 22(1)

[Dep. Zool., Univ. Toronto, Toronto, ON M5S 1A1, Canada] The gill area and skin area of /Chaenocephalus aceratus/ increases in proportion to body weight by exponents of 1.09 and 0.59 respectively. The scaleless skin of this fish does not appear to be a necessary respiratory compensation for the lack of hemoglobin. The gill area of /C. aceratus/ is similar to that of several other species of red blooded polar fish. The heart of /C. aceratus/ is 2-3 times larger than that of the other fish examined. Its spleen and many other parts of its body are comparatively large and it is suggested that this may be a consequence of reduced axial musculature.

77-000031 Hughes, G. M.; Perry, S. F. MORPHOMETRIC STUDY OF TROUT GILLS: A LIGHT-MICROSCOPIC METHOD SUITABLE FOR THE EVALUATION OF POLLUTANT ACTION. J. Exp. Biol. 64 (2): 447-460. Apr. 1976. SFA 22(1)

[Res. Unit Comp. Anim. Respiration, Bristol Univ., England] Methods are described for the morphometric estimation of parameters of the gill system of trout which are relevant to its function in gas exchange. The methods have been used with 1 um sections viewed under the light microscope. In particular the diffusion distances between water and blood are measured, which together with determinations of gill area, provide figures for the morphometrically estimated diffusing capacity. The methods have been used to compare the diffusing capacity of gills from control fish and those treated in polluted waters. The concept of relative diffusing capacity (/D/[rel]) is introduced which enables comparisons to be made without the need to determine the absolute diffusing capacity. Quantitative estimation of changes in relative volumes and surface areas of components of the secondary lamellae were determined, and employed to explain the possible anatomical causes of changes in /D/(rel). It is suggested that these methods can be of value in the comparison of the gills of fish treated in different waters.

77-000032 Korovina, V. M. THE INTESTINAL SPIRAL VALVE OF THE BALTIC HERRING, /CLUPEA HARENGUS MEMBRAS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 921-926. 1975. SFA 22(1)

[Inst. Zool., USSR Acad. Sci., Leningrad, USSR] The anatomical and histological characteristics of the midgut of the Baltic herring, /Clupea harengus membras/, was studied. A genuine spiral valve is developed in the posterior section. The entire mucous membrane and part of the muscular layer participate in its formation.

77-000033 Markov, K. P. SCANNING ELECTRON MICROSCOPE STUDY OF THE MICROSTRUCTURE OF THE EGG MEMBRANE IN THE RUSSIAN STURGEON (/ACIPENSER GULDENSTADTI/). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 739-749. 1975. SFA 22(1)

; [IEMEZh, USSR Acad. Sci., Moscow, USSR]

77-000034 Mezhnin, F. I. MORPHOLOGY OF THE ADRENAL GLAND IN SOME CYPRINIDS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 913-920. 1975. SFA 22(1)
[USSR Acad. Sci., Borok, Yaroslavl Prov., USSR] the histologic structure and topography of the adrenocortical and adrenomedullary tissues was studied in 10 species of the family Cyprinidae. The species differences and individual features of the topography and morphology of the two endocrine glands studied are indicated in the fish investigated.

77-000035 Mikulin, A. Ye.; Soin, S. G. THE FUNCTIONAL SIGNIFICANCE OF CAROTENOIDS IN THE EMBRYONIC DEVELOPMENT OF TELEOSTS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 749-759. 1975. SFA 22(1)
[Dep. Ichthyol., Moscow Univ., USSR] The article contains a discussion of the data obtained by different authors on the qualitative composition of carotenoids extracted from various fish organs and tissues and from fish eggs. Consideration is given to the part played by carotenoids in the coloration of fishes, in the perception of light, in the processes of egg fertilization and in the protection of eggs against various environmental factors, the part played by carotenoids in the formation of vitamin A and also their connection with respiratory conditions. We suggest on the basis of published data and the results of our own research that carotenoids are involved in redox processes.

77-000036 Niimi, A. J. RELATIONSHIP OF BODY SURFACE AREA TO WEIGHT IN FISHES. Can. J. Zool. 53 (8): 1192-1194. Aug. 1975. In English with French summ. SFA 22(1)
[Dep. Biol., Univ. Ottawa, Ottawa, ON K1N 6N5, Canada]
The relationship of body surface area to weight in fishes can be expressed by the equation S = KW(to the /b/). The values of K and /b/ can vary among species as well as during the different life stages of a species. For the species examined in this study, the values of K ranged from 5.8 to 10.8 and /b/ from 0.64 to 0.74.

77-000037 Otcbo, F. O. OBSERVATIONS ON MERISTIC CHARACTERS SEPARATING /PELLONULA AFZELIUSI/ JOHNELS, 1954 FROM /SIERRATHRISSA LEONENSIS/ THYS VAN DEN AUDERNAERDE, 1969. J. Fish. Biol. 8 (4): 303-310. Apr. 1976. SFA 22(1)
[Dep. Biol. Sci., Univ. Ife, Ife-Ife, Nigeria] The meristic features of /Pellonula afzeliusi/ and /Sierrathrissa leonensis/ are compared to remove the confusion that has arisen over the identity of two clupeid species in West African freshwaters. The discovery of a breeding population of /S. leonensis/ in Kainji Lake confirms that it is correct to regard /S. leonensis/ as a separate species and not the young of either /Pellonula/ or /Cynothrissa/.

77-000038 Pavlovskaya, L. P.; Zholdasova, I. M. A STUDY OF THE TESTES OF THE DIADROMOUS ARAL BARBEL, /BARBUS BRACHYCEPHALUS/, IN THE LOWER REACHES OF THE AMU DAR'YA. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 1012-1017. 1975. SFA 22(1)
[Gen. Inst. Nat. Sci., Nukus, USSR]

77-000039 Rudometkina, G. P. POSTEMBRYONIC DEVELOPMENT OF /VINCIGUERRIA NIMBARIA/ FROM THE ATLANTIC OCEAN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 940-950. 1975. SFA 22(1)
[Atlant. NIRC, Kaliningrad, USSR] The variability of the morphological and meristic characters and pigmentation at different stages in the postembryonic development of /Vinciguerria nimbaria/ living in the Atlantic Ocean between 40°N and 27°S is discussed.

77-000040 Verigina, I. A. STRUCTURE OF THE ALIMENTARY CANAL IN SOME OF THE NORTHERN BLENNIOIDEI. II. ALIMENTARY CANAL OF THE EELPOUT (/ZOARCES VIVIPARUS/). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 770-775. 1975. SFA 22(1)
[Zool. Inst., Moscow Univ., USSR] The present article, which is a continuation of an investigation of the digestive system of some of the northern Blennioidei from the point of view of its adaptation to feeding contains an investigation of the structure of the alimentary canal in the eelpout (/Zoarces viviparus/). The absence of principal glands from the fundal and pyloric divisions of the stomach is noted. There is a discussion of the need for histological studies to establish the total or partial reduction of the stomach. The intestinal structure of /Pholis gunnelus/ and /Lumpenus fabricii/ is investigated for purposes of comparison.

77-000041 Yamaguchi, K.; Hashimoto, K.; Matsuura, F. IDENTITY OF BLUE PIGMENTS OBTAINED FROM DIFFERENT TISSUES OF THE SCULPIN, /PSEUDOBLENNIUS PERCOIDES/ GUNTHER. Comp. Biochem. Physiol. B Comp. Biochem. 55 (1): 85-87. 1976. SFA 22(1)
[Lab. Mar. Biochem., Fac. Agric., Univ. Tokyo, Tokyo, Japan] Blue chromoproteins were isolated from the skin, muscle, digestive tract and eggs of the sculpin, /Pseudoblennius percoides/ Gunther. They showed the same absorption spectrum and almost the identical molecular weights (38,000-42,000) and isoelectric points (3.4-3.7). The identity of these chromoproteins was confirmed by isoelectric focussing with mixed samples. Their chromophores were identified as being solely biliverdin IX. It may be concluded that one and the same biliverdin-protein exists in the different tissues of this fish.

77-000042 Zyznar, E. S.; Ali, M. A. AN INTERPRETATIVE STUDY OF THE ORGANIZATION OF THE VISUAL CELLS AND TAPETUM LUCIDUM OF /STIZOSTEDION/. Can. J. Zool. 53 (2): 180-196. Feb. 1975. In English with French summ. SFA 22(1)
[Dep. Biol. Sci., Univ. Montreal, Montreal 101, PQ, Canada]

PHYSIOLOGY

77-000043 Ahokas, R. A.; Sorg, G. THE EFFECT OF SALINITY AND TEMPERATURE ON INTRACELLULAR OSMOREGULATION AND MUSCLE FREE AMINO ACIDS IN /FUNDULUS DIAPHANUS/. Comp. Biochem. Physiol. A Comp. Physiol. 56 (1:) 101-105. 1977. SFA 22(1)
[Dep. Obstet. Gynecol., Univ. Tenn. Cent. Health Sci., Memphis 38163] /Fundulus diaphanus/ tolerates both freshwater and 30°/oo sea water at 15°C. At 0.5°C only freshwater was tolerated well, and only 50 percent of the sample population survived in 30°/oo sea water after 2 weeks. At 15°C tissue inorganic ions and free amino acids increased with an increase in ambient salinity. In freshwater adapted fish, tissue K^+ increased while free amino acids decreased with a decrease in water temperature. The primary amino acids involved with salinity

77-000043 CONTINUED
change were alanine, glycine, serine, proline, and aspartic acid. Taurine did not change with salinity and apparently does not function in intracellular osmoregulation.

77-000044 Akoev, G. N.; Ilyinsky, O. B.; Zadan, P. M. PHYSIOLOGICAL PROPERTIES OF ELECTRORECEPTORS OF MARINE SKATES. Comp. Biochem. Physiol. A Comp. Physiol. 53 (2): 201-209. 1976. SFA 22(1)
[Pavlov Inst. Physiol., Acad. Sci. USSR, Leningrad, USSR]

77-000045 Ando, M.; Utida, S.; Nagahama, H. ACTIVE TRANSPORT OF CHLORIDE IN EEL INTESTINE WITH SPECIAL REFERENCE TO SEA WATER ADAPTATION. Comp. Biochem. Physiol. A Comp. Physiol. 51 (1): 27-32. May 1975. SFA 22(1)
[Zool. Inst., Fac. Sci., Hiroshima Univ., Senda-Cho, Hiroshima 730, Japan]

77-000046 Ando, M. INTESTINAL WATER TRANSPORT AND CHLORIDE PUMP IN RELATION TO SEA-WATER ADAPTATION OF THE EEL, /ANGUILLA JAPONICA/. Comp. Biochem. Physiol. A Comp. Physiol. 52 (1:) 229-233. Sept. 1975. SFA 22(1)
[Lab. Physiol., Ocean Res. Inst., Univ. tokyo, Nakano, Tokyo 164, Japan]

77-000047 Asai, H.; Takagi, H.; Tsunoda, S. SOME CHARACTERISTICS OF ERYTHROCYTE MEMBRANE AND ITS ATPASE FROM LAMPREY, /ENTOSPHENUS JAPONICUS/. Comp. Biochem. Physiol. B Comp. Biochem. 55 (1): 69-75. 1976. SFA 22(1)
[Dep. Phys., Waseda Univ., Tokyo 160, Japan]

77-000048 Bailey, J. R.; Fenwick, J. C. THE EFFECT OF STANNIECTOMY AND PLASMA CALCIUM LEVELS ON BLOOD PRESSURE IN THE EEL, /ANGUILLA ROSTRATA/ LESUEUR. Comp. Biochem. Physiol. A Comp. Physiol. 51 (3): 693-697. July 1975. SFA 22(1)
[J. C. Fewick: Dep. Biol., Univ. Ottawa, Ottawa, ON K1N 6N5, Canada]

77-000049 Bailey, J. R.; Fenwick, J. C. EFFECT OF ANGIOTENSION II AND CORPUSCLE OF STANNIUS EXTRACT ON TOTAL AND IONIC PLASMA CALCIUM LEVELS AND BLOOD PRESSURE IN INTACT EELS (/ANGUILLA ROSTRATA/ LESUEUR). Can. J. Zool. 53 (5): 630-633. May 1975. In English with French summ. SFA 22(1)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

77-000050 Baines, G. W. BLOOD PH EFFECTS IN EIGHT FISHES FROM THE TELEOSTEAN FAMILY SCORPAENIDAE. Comp. Biochem. Physiol. A Comp. Physiol. 51 (4): 833-843. Aug. 1975. SFA 22(1)
[Mar. Sci. Inst., Dep. Biol. Sci., Univ. Calif., Santa Barbara 93106] Erythrocyte suspensions were equilibrated with varicus concentrations of oxygen in a flowing gas tonometer and the per cent saturation was measured photometrically in the Soret band. Results show that the magnitude of the Root effect varies consistently with the requirements of the swimbladder filling mechanism. Sedentary fish that live in shallow water have smaller pH effects whereas active forms from deeper water have greater pH effects. /Scorpaena guttata/, which lacks a swimbladder, has the smallest pH effect.--From abstr.

77-000051 Bakhteyeva, V. T. CATION CONCENTRATION IN THE BLOOD SERUM OF THE SOCKEYE, /ONCORHYNCHUS NERKA/, OF DIFFERENT INTRASPECIFIC GROUPS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 980-984. 1975. SFA 22(1)
[I.M. Sechenov Inst. Evol. Physiol. Biochem., USSR Acad. Sci., Leningrad, USSR] The concentration of sodium, potassium, calcium and magnesium in the blood serum of spawned-out sockeye, /Oncorhynchus nerka/, in different subisolates of the spring and summer races of local populations of Lake Azabach'ye and also of other salmonids living in this reservoir, the lake-river and diadromous Arctic char, /Salvelinus alpinus/, and the "mikizha", /Salmo mykiss/, was studied. It was established that not only the species but also the complicated species structure expressed in the existence of populations, races and subisolates in the sockeye, and of forms in the char, are reflected in the peculiarities of the ion composition of the body, which are manifested in significant differences in ion concentration in the blood serum of fishes belonging to different species and intraspecific groups.

77-000052 Bartlett, G. R. PHOSPHATE COMPOUNDS IN RED CELLS OF REPTILES, AMPHIBIANS AND FISH. Comp. Biochem. Physiol. A Comp. Physiol. 55 (3): 211-214. 1976. SFA 22(1)
[Lab. Comp. Biochem., San Diego, CA 92109]

77-000053 Bentley, P. J.; Maetz, J.; Payan, P. A STUDY OF THE UNIDIRECTIONAL FLUXES OF NA AND CL ACROSS THE GILLS OF THE DOGFISH /SCYLIORHINUS CANICULA/ (CHONDRICHTHYES). J. Exp. Biol. 64 (3): 629-637. June 1976. SFA 22(1)
[Dep. Pharmacol., Mt. Sinai Sch. Med. City Univ. New York, NY 10029] The gills of the dogfish /Scyliorhinus canicula/ are more permeable to Cl than to Na. In sea water, influx of Na and Cl exceeded the efflux of these ions. Under these conditions the fish were slightly electronegative, by about 2 mV, to the external solution. The net accumulation of Cl could be accounted for by diffusion along the observed electrochemical gradient but the movement of Na into the fish was more consistent with an electrically neutral active Na transport mechanism (using the Ussing flux ratio criterion). When the external pH was changed from 7.8 to 6.9, influxes of Na and Cl were depressed, while the effluxes were unaffected, and the fish became slightly less electronegative. In artificial solutions, in which the concentrations of Na and Cl were lowered and replaced with urea to maintain the total osmotic concentration, Na influx displayed saturation kinetics, while Na efflux increased with decreasing Na concentrations. Cl influx decreased linearly, while Cl efflux remained constant. The efflux of Cl could not be reconciled with a process of passive diffusion along any of the observed electrochemical gradients and thus could reflect the presence of an active transport mechanism.

77-000054 Bessonov, B. I.; Butsuk, S. V.; Fedorov, A. I. THE ELECTRICAL FIELD OF FISH SKIN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 836-838. 1975. SFA 22(1)
[Mar. Biol. Inst., USSR Acad. Sci., Vladivostock, USSR]

77-000055 Bieniarz, K.; Epler, P. PRELIMINARY RESULTS OF THE /IN VIVO/ STUDIES ON OVARIAN RESORPTION IN CARP (/CYPRINUS CARPIO/ L.). J. Fish. Biol. 8 (6): 449-451. June 1976. SFA 22(1)
[Inst. Appl. Zool., Acad. Agric., Krakow, Poland] Oocyte resorption in the ovaries of sexually mature carp, which did not spawn, was investigated using a method of sampling ovaries /in vivo/. A 2-year study revealed that a portion of the oocytes had undergone a slow resorption while the basic mass of the ovaries, throughout the experiment, consisted of the oocytes similar to those of stage IV of sexual maturity. At the same time no growth of the oocytes of the earlier maturation stages was found. The condition of the ovaries in the females studied indicated their complete infertility, at least for three successive spawning periods.

77-000056 Cameron, J. N. BRANCHIAL ION UPTAKE IN ARCTIC GRAYLING: RESTING VALUES AND EFFECTS OF ACID-BASE DISTURBANCE. J. Exp. Biol. 64 (3): 711-725. June 1976. SFA 22(1)
[Mar. Sci. Lab., Univ. Texas, Port Aransas 78373]

77-000057 Campbell, C. M.; Davies, P. S. THERMAL ACCLIMATION IN THE TELEOST, /ELENNIUS PHOLIS/ (L). Comp. Biochem. Physiol. A Comp. Physiol. 52 (1): 147-151. Sept. 1975. SFA 22(1)
[Dep. Zool., Univ. Glasgow, Glasgow G12 8QQ, Scotland] The Q(10) of the resting metabolic rate in /Blennius pholis/ decreased as the acute temperature rose and was not affected by the temperature of acclimation. Thermal acclimation of metabolic rate which occurred at all times of year was partial and corresponded to Prosser's type IIA. Thermal acclimation was reversible and was lost after 60 days of starvation. The acclimation time was 2-3 weeks. The critical thermal maxima (CTMax) and minima (CTMin) were shifted upwards with warm-acclimation and downwards with cold-acclimation. Cold acclimation had a more extensive effect than warm acclimation as evidenced by a low Q(10) value for metabolic rate and an increased thermal tolerance range towards the lower end of the temperature scale.

77-000058 Capra, M. F. CARDIO-RESPIRATORY RELATIONSHIPS DURING "EUPNOEA" AND RESPIRATORY ARRHYTHMIAS IN THE PORT JACKSON SHARK, /HETERODONTUS PORTUSJACKSONI/. Comp. Biochem. Physiol. A Comp. Physiol. 53 (3): 259-262. 1976. SFA 22(1)
[Dep. Zool., Univ. Otago, Dunedin, New Zealand]

77-000059 Capra, M. F. A TECHNIQUE FOR RECORDING THE RESPIRATORY MOVEMENTS OF UNRESTRAINED ELASMOBRANCH FISH. J. Fish. Biol. 9 (1): 1-2. July 1976. SFA 22(1)
[Dep. Zool. Comp. Physiol., Univ. Birmingham, Birmingham B15 2TT, England]

77-000060 Caprio, J. HIGH SENSITIVITY OF CATFISH TASTE RECEPTORS TO AMINO ACIDS. Comp. Biochem. Physiol. A Comp. Physiol. 52 (1): 247-251. Sept. 1975. SFA 22(1)
[Dep. Biol. Sci., Fla. State Univ., Tallahassee 32306] gustatory receptors on the maxillary barbel of the channel catfish /Ictalurus punctatus/ are extremely sensitive to the alpha-amino acids. The seven most effective of the thirty amino acids tested were L-alanine greater than L-arginine greater than L-serine greater than L-alpha-aminobutryic acid greater than Liglutamine D-alanine greater than glycine. The threshold concentration for the more effective amino acids was estimated to range between 10^{-9} and 10^{-11} M, the lowest

77-000060 CONTINUED
electrophysiological thresholds reported for taste in any vertebrate. The L-isomer of an amino acid was more effective than its D-isomer. In the catfish, taste would appear to be an important distance sense having behavioral implications.

77-000061 Catlett, R. H.; Millich, D. R. INTRACELLULAR AND EXTRACELLULAR OSMOREGULATION OF TEMPERATURE ACCLIMATED GOLDFISH: /CARASSIUM AURATUS/ L. Comp. Biochem. Physiol. A Comp. Physiol. 55 (3): 261-269. 1976. SFA 22(1)
[Dep. Biol., Univ. Colo., Colorado Springs 80907] Goldfish were acclimated to temperatures ranging from 21.5 to 1°C. Acclimation to near freezing temperatures caused a reduction in plasma osmolality due to decreased organic solutes as well as reduced plasma inorganic ions. Plasma Na^+ concn decreased in lower temperatures; plasma Cl^- did not. RBC response to decreased plasma osmolality included phases: osmotic swelling followed by cellular shrinkage. Cellular shrinkage resulted from efflux of KCL and water. The over-all response is an example of "isosmotic intracellular regulation" achieved by adjusting osmotically active particles.

77-000062 Chan, K. K.-S. A PHOTOSENSITIVE DAILY RHYTHM IN THE FEMALE MEDAKA, /ORYZIAS LATIPES/. Can. J. Zool. 54 (6): 852-856. June 1976. In English with French summ. SFA 22(1)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada] Adult female medaka, /Oryzias latipes/, with regressed ovaries were exposed to 7 h of continuous light plus an additional hour of light at different times during the dark period of a 24-h cycle (7 + 1 light: 16 dark) at 24 ± 1°C. When this additional hour of light falls on the 16th h, counting the onset of the light period as the 0 h, ovarian development was induced. This ovarian development is enhanced when the exposure period is increased and when the fish are preexposed to a warm temperature. The use of a photosensitive daily rhythm to measure photoperiod and to time the spawning season in the medaka is suggested.

77-000063 Courtois, L. A. HEMATOLOGY OF JUVENILE STRIPED BASS, /MORONE SAXATILIS/ (WALBAUM), ACCLIMATED TO DIFFERENT ENVIRONMENTAL CONDITIONS. Comp. Biochem. Physiol. A Comp. Physiol. 54 (2:) 221-223. 1976. SFA 22(1)
[Dep. Fish Game, Water Pollut. Control Lab., Rancho Cordova, CA 95670] Juvenile striped bass were acclimated to different combinations of temperature and salinity and fed a uniform test diet. Changes in hematocrit, hemoglobin, total serum protein, and serum electrolytes were correlated to different environmental factors.

77-000064 Courtois, L. A. RESPIRATORY RESPONSES OF /GILLICHTHYS MIRABILIS/ TO CHANGES IN TEMPERATURE, DISSOLVED OXYGEN AND SALINITY. Comp. Biochem. Physiol. A Comp. Physiol. 53 (1): 7-10. 976. SFA 22(1)
[Dep. Fish Game, Water Pollut. Control Lab., Rancho Cordova, CA 95670] The respiratory rate of /G. marabilis/ increased with increasing temperature, decreased with decreasing ambient oxygen, and remained relatively constant over a wide range of salinities (14.8, 26.3, 55.8, 65.2°/oo). Changes in salinity do not greatly modify respiratory rate for this species.

77-000065 Cvancara, V. A.; Stieber, S. F.; Cvancara, B. A. SUMMER TEMPERATURE TOLERANCE OF SELECTED SPECIES OF MISSISSIPPI RIVER ACCLIMATED YOUNG OF THE YEAR FISHES. Comp. Bicchem. Physicl. A Comp. Physiol. 56 (1): 81-85. 1977. SFA 22(1)
[Dep. Biol., Univ. Wis., Eau Claire 54701] The temperature tolerance was determined for 8 species of young of the year fish taken from the Mississippi River during periods of high summer temperature. Under the experimental conditions described, LD(50) values were determined as follows: /Dorosoma cepedianum/, 28.5°C; /Lepomis macrochirus/, 28.5°C; /Esox lucius/, 30.8°C; /Aplodinotus grunniens/, 32.8°C; /Morone chrysops/, 33.5°C; /Carpiodes carpio/, 35.2°C; /Micropterus salmoides/, 35.6°C and /Ictalurus melas/, 35.7°C.

77-000066 Dave, G.; Johansson-Sjobeck, M.-L.; Larsson, A.; Lewander, K.; Lidman, U. METABOLIC AND HEMATOLOGICAL EFFECTS OF STARVATION IN THE EUROPEAN EEL, /ANGUILLA ANGUILLA/ L.--III. FATTY ACID COMPOSITION. Comp. Biochem. Physiol. B Comp. Biochem. 53 (4): 509-515. 1976. SFA 22(1)
[Dep. Zoophysiol., Univ. Goteborg, Pack, S-400 33 Goteborg 33, Sweden]

77-000067 de Vlaming, V. L.; Pardo, R. J. /IN VITRO/ EFFECTS OF INSULIN ON LIVER LIPID AND CARBOHYDRATE METABOLISM IN THE TELEOST, /NOTEMIGONUS CRYSOLEUCAS/. Comp. Biochem. Physiol. B Comp. Biochem. 51 (4): 489-497. Aug. 1975. SFA 22(1)
[Dep. Biol., Marquette Univ., Milwaukee, WI 53233]

77-000068 Dean, J. M. TEMPERATURE OF TISSUES IN FRESHWATER FISHES. Trans. Am. Fish. Soc. 105 (6): 709-711. Nov. 1976. SFA 22(1)
[Dep. Biol., Univ. S. Car., Columbia 29208] A thermistor probe was used to study deep (white) muscle temperature of five species of freshwater fishes at rest as well as that of exercising and resting trout. The resting deep muscle temperatures were 0.1 to 1.1 C higher than the water temperature. In exercising trout, temperatures of the deep muscle were the same as the temperature of the water.

77-000069 Denton, J. E.; Yousef, M. K. BODY COMPOSITION AND ORGAN WEIGHTS OF RAINBOW TROUT, /SALMO GAIRDNERI/. J. Fish. Biol. 8 (6): 489-499. June 1976. SFA 22(1)
[Inst. Environ. Stress, Univ. Calif., Santa Barbara 93106] Body fat and protein content as a percentage of body weight increased with age, the water content declined, and the ash content remained constant during the first 14 months of life. There were no significant differences in body composition between immature male and female rainbow trout. Total body ions as a proportion of ash content decreased until the 10th month and then began to increase. During starvation, fat was used as the primary source of energy while water and ash content increased and protein content remained constant as a percentage of body weight. The gall bladder, liver, and air bladder remained relatively constant as a percentage of body weight during the first year of life. As body weight increased, the relative weight of brain, heart, and digestive system decreased while the gonad and spleen weight increased.--From abstr.

77-000070 Denton, J. E.; Yousef, M. K. SEASONAL CHANGES IN HEMATOLOGY OF RAINBOW TROUT, /SALMO GAIRDNERI/. Comp. Biochem. Physiol. A Comp. Physiol. 51 (1): 151-153. May 1975. SFA 22(1)
[Inst. Environ. Stress, Univ. Calif., Santa Barbara 93106] A study on hematology of rainbow trout was conducted to test whether or not seasonal changes are due to changes in water temperature. Although water temperature was maintained about the same throughout the study, seasonal changes were evident in hemoglobin, hematocrit, serum protein, mean cell volume, mean cell hemoglobin and mean cell hemoglobin concentration. In conclusion, water temperature does not seem to be responsible for variations in hematology of rainbow trout. Diet, metabolic adaptations and activity are suggested as probable causes of seasonal changes.

77-000071 Driedzic, W.; Selivonchick, D. P.; Roots, E. I. ALK-1-ENYL EITHER-CONTAINING LIPIDS OF GOLDFISH (/CARASSIUS AURATUS/ L.) BRAIN AND TEMPERATURE ACCLIMATION. Comp. Biochem. Physiol. B Comp. Biochem. 53 (3): 311-314. 1976. SFA 22(1)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

77-000072 Driedzic, W. R.; Hochachka, P. W. THE UNANSWERED QUESTION OF HIGH ANAEROBIC CAPABILITIES OF CARP WHITE MUSCLE. Can. J. Zool. 53 (6): 706-712. June 1975. In English with French summ. SFA 22(1)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada] Carp white muscle is considered to have a very high anaerobic capability; however, the accumulation of lactate is often not proportional to the amount of energy which must be generated. On the basis of whole-animal studies it is known that some fish produce NH(4) + and CO(2) anaerobically. This is interesting in light of the concept that many invertebrate facultative anaerobes simultaneously utilize carbonhydrates and amino acids with the production of a variety of end products. We tested the hypothesis that in carp white muscle (a) lactate was not the sole end product of anaerobic metabolism and (b) amino acids were utilized as an anaerobic energy source. After an anaerobic work period induced by hypoxia we could detect none of the end products known to build up in invertebrate tissues and no mobilization of the free amino acid pool. Thus, carp white muscle appears to depend solely on glycogenolysis. The low level of lactate in carp white muscle even after severe hypoxic stress may be due to the transfer of this compound out of the tissue despite poor vascularization.

77-000073 Duman, J. G.; DeVries, A. L. ISOLATION, CHARACTERIZATION, AND PHYSICAL PROPERTIES OF PROTEIN ANTIFREEZES FROM THE WINTER FLOUNDER, /PSEUDOPLEURONECTES AMERICANUS/. Comp. Biochem. Physiol. B Comp. Biochem. 54 (3): 375-380. 1976. SFA 22(1)
[Dep. Biol., Univ. Notre Dame, Notre Dame, IN 46556] Three proteins with an unusual ability to depress the freezing point of water have been purified from the blood serum of the winter flounder, /Pseudopleuronectes americanus/. The amino acid compositions of these proteins are essentially the same and consist of large amounts of alanine, threonine and aspartic acid. The flounder protein antifreeze is quite different compositionally from the glycoprotein antifreeze previously isolated from antarctic nototheniid fishes. Therefore it seems that macromolecular antifreeze solutes have evolved independently in fishes at least twice.

77-000074 Duman, J. G.; DeVries, A. L. THE ROLE OF MACROMOLECULAR ANTIFREEZES IN COLD WATER FISHES. Comp. Biochem. Physiol. A Comp. Physiol. 52 (1:) 193-199. Sept. 1975. SFA 22(1)

[Dep. Biol., Univ. Notre Dame, Notre Dame, IN 46566] Techniques useful in screening the blood serum of fishes for the presence of macromolecular antifreeze compounds are described and discussed. Several species of teleost fishes, representing phylogenetically widely divergent families, are shown to have macromolecular antifreeze substances in their blood serum. The antifreeze compounds may account for as much as 60 percent of the freezing point depression of the serum. The antifreeze substances lower the freezing point of the serum without appreciably depressing the melting point, thereby resulting in a thermal hysteresis.

77-000075 Eddy, F. B. ACID-BASE BALANCE IN RAINBOW TROUT (/SALMO GAIRDNERI/) SUBJECTED TO ACID STRESSES. J. Exp. Biol. 64 (1): 159-171. Feb. 1976. SFA 22(1)

[Dep. Biol. Sci., Univ. Dundee, Dundee DD1 1HN, Scotland] The respiratory properties of rainbow-trout blood were investigated in acid-stressed fish. In the first group acid was introduced into the bloodstream and in the second the carbon dioxide content of the ambient water was increased. Initially the introduction of acid to the blood caused a decrease in blood pH and bicarbonate, and increases in oxygen uptake and ventilation volume. After 2-3 h these values had returned to the control levels. Trout subjected to high ambient CO(2) (about 10 mmHg) showed a decrease in blood pH while /P/(CO[2]) and bicarbonate increased. After 8 h the trout began to show signs of compensation to the acidosis. In each experiment the blood /P/(O[2]) was little changed but blood O(2) content was decreased and tended not to resume the control value even after several hours. The results are discussed in terms of the various acid-base mechanisms thought to be available to the fish. These include branchial ion exchanges and the possible buffering roles of the extracellular and intracellular fluids.

77-000076 Epstein, F. H.; Silva, P.; Forrest, J. N.; Solomon, R. J. CHLORIDE TRANSPORT AND ITS INHIBITION BY THIOCYANATE IN GILLS OF SEAWATER TELEOSTS. Comp. Biochem. Physiol. A Comp. Physiol. 52 (4): 681-683. Dec. 1975. SFA 22(1)

[Dep. Med., Harvard Med. Sch., Boston, MA]

77-000077 Evans, D. H. IONIC EXCHANGE MECHANISMS IN FISH GILLS. Comp. Biochem. Physiol. A Comp. Physiol. 51 (3): 491-495. July 1975. SFA 22(1)

[Dep. Biol., Univ. Miami, Coral Gables, FL 33124] The evidence for the current model for ionic exchange mechanisms across the outer surface of the fresh water acclimated fish gill is reviewed. It is suggested that recent evidence indicates that the uptake of NaCl for ionic regulation is secondary to the extrusion of $HCO(3)^-$, H^+ and $NH(4)^+$ and that the exchange systems may be functioning in sea water acclimated fish that already face a Nacl load. It is further suggested that all marine fish may already have the NaCl uptake mechanisms needed for ionic regulation in fresh water but are restricted to the marine environment because of low efficiency NaCl uptake mechanism and a relatively high ionic permeability. This ionic permeability may be under the control of intrinsic hormones (prolactin) and external calcium concentration.

77-000078 Fange, R.; Lidman, U.; Larsson, A. COMPARATIVE STUDIES OF INORGANIC SUBSTANCES IN THE BLOOD OF FISHES FROM THE SCAGERAC SEA. J. Fish. Biol. 8 (6): 441-448. June 1976. SFA 22(1)
[Dep. Zoophysiol., Univ. Goteborg, Pack, S-400 33 Goteborg, Sweden] The concentrations of the main plasma inorganic electrolytes Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^- and $PO(4)^{3-}$ have been determined for different orders of marine fishes. For Na^+ and Cl^- a typical decrease was found when passing from cyclostomes, holocephalans and elasmobranchs to teleosts. The concentrations of K^+, Ca^{2+} and Mg^{2+} showed a similar trend except that there was a rise in the teleost group, which showed a large range of variation for these three ions. In the case of $PO(4)^{3-}$ no significant differences between groups were found.

77-000079 Fange, R.; Johansson-Sjobeck, M.-L. THE EFFECT OF SPLENECTOMY ON THE HEMATOLOGY AND ON THE ACTIVITY OF DELTA-AMINOLEVULINIC ACID DEHYDRATASE (ALA-D) IN HEMOPOIETIC TISSUES OF THE DOGFISH, /SCYLIORHINUS CANICULA/ (ELASMOBRANCHII). Comp. Biochem. Physiol. A Comp. Physiol. 52 (4): 577-580. Dec. 1975. SFA 22(1)
[Dep. Zoolphysiol., Univ. Goteborg, Pack, S-400 33 Goteborg 33, Sweden]

77-000080 Fletcher, G. L. THE EFFECTS OF CAPTURE, "STRESS," AND STORAGE OF WHOLE BLOOD ON THE RED BLOOD CELLS, PLASMA PROTEINS, GLUCOSE, AND ELECTROLYTES OF THE WINTER FLOUNDER (/PSEUDOPLEURONECTES AMERICANUS/). Can. J. Zool. 53 (2): 197-206. Feb. 1975. In English with French summ. SFA 22(1)
[Mar. Sci. Res. Lab., Memorial Univ., St. John's, NF, Canada]

77-000081 Fourie, F. le R.; van Vuren, J. H. H. A SEASONAL STUDY ON THE HEMOGLOBINS OF CARP (/CYPRINUS CARPIO/) AND YELLOWFISH (/BARBUS HOLUBI/) IN SOUTH AFRICA. Comp. Biochem. Physiol. B Comp. Biochem. 55 (4): 523-525. 1976. SFA 22(1)
[Dep. Zool., Rand Afrikaans Univ., Johannesburg, South Africa] Hemoglobin of carp (/Cyprinus carpio/) and yellowfish (/Barbus holubi/) were separated on polyacrylamide gel electrophoresis, total hemoglobin concentration determined and erythrocyte dimensions monitored throughout the three seasons. Carp initially contained two hemoglobin fractions, gained a new fraction during winter which disappeared again in summer and yellowfish exhibited five hemoglobin fractions during the study period. Erythrocyte dimensions fluctuated throughout the season. It is concluded that different erythrocyte populations are present during the season which contain different hemoglobins.

77-000082 Fryer, J. N. STRESS AND ADRENOCORTICOSTEROID DYNAMICS IN THE GOLDFISH, /CARASSIUS AURATUS/. Can. J. Zool. 53 (8): 1012-1020. Aug. 1975. In English with French summ. SFA 22(1)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E1, Canada] In goldfish serum, cortisol was found to constitute 77.6 percent of the adrenocorticosteroids measured by a competitive protein-binding radioassay. Adult goldfish maintained on a photoperiod of 14 h light: 10 h dark in November exhibited no significant variation in serum corticosteroid concentration throughout the 24-h cycle. Goldfish maintained in an 8L:16D photoperiod in June exhibited two peaks in serum adrenocorticosteroid concentration. Four hours before the onset of the light period and 4 h after the onset of the light period, serum corticosteroids were significantly higher than those observed at the midpoint of the dark period. After sham injection, swimming in shallow water, or a thermal shock, but not a handling disturbance, circulating

77-000082 CONTINUED
levels of corticosteroies were significantly higher than in undisturbed fish. Betamethasone injected 24 h before a thermal stress completely blocked the stress-induced increase in serum corticosteroids observed in vehicle-injected and uninjected goldfish, demonstrating the potency of this steroid as a blocker of the pituitary-interrenal axis in this species.

77-000083 Fursa, T. I. CUTLASSFISH (/LEPTURACANTHUS SAVALA/ [TRICHIURIDAE, PISCES]) LARVAE IN THE INDIAN OCEAN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 760-764. 1975. SFA 22(1)
[AzCherNIRO, Kerch, USSR]

77-000084 Gee, J. H.; Gee, P. A. ALTERATION OF BUOYANCY BY SOME CENTRAL AMERICAN STREAM FISHES, AND A COMPARISON WITH NORTH AMERICAN SPECIES. Can. J. Zool. 54 (3): 386-391. Mar. 1976. In English with French summ. SFA 22(1)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada] Of 23 species (nine families) of Central American fishes examined, nine (eight physostomes, one physoclist) did not reduce buoyancy by decreasing swim-bladder volume when current was encountered. The remainder (six physostomes, eight physoclists) decreased buoyancy, usually within 24-25 h, but three of these species (one physostome) were unable to maintain a reduced buoyancy for as long as 72 h once the minimum was achieved. All species have an excess internal pressure of swim-bladder gas. All of the North American species that have been studied do show a buoyancy alteration in response to changes in water current and adjust to a greater extent, although rates of adjustment appear similar to those of Central American fishes. Differences in flow regime between North and Central American streams are described and may partially account for these differences in reaction to water current.

77-000085 Gharrett, A. J.; Simon, R. C.; McIntyre, J. D. REASSOCIATION AND HYBRIDIZATION PROPERTIES OF DNAS FROM SEVERAL SPECIES OF FISH. Comp. Biochem. Physiol. B Comp. Biochem. 56 (1): 81-85. 977. SFA 22(1)
[Dight Inst., Univ. Minn., Minneapolis 55455] Reassociation and hybridization properites from spectrophotometric studies of DNAs from 10 species of fish indicate: Great diversity in the amounts of repeated sequences of the genomes of different species--more specialized fish had less redundancy; large differences in the complexities of the DNAs--more specialized fish had less information; little homology between sequences of remotely related species but substantial homology between sequences of closely related species.

77-000086 Golovanenko, L. F.; Shuvatova, T. F. SOME PHYSIOLOGICAL INDICATORS OF THE AZOV PIKE-PERCH (/LUCIOPERCA LUCIOPERCA/) FROM DIFFERENT HABITATS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 833-836. 1975. SFA 22(1)
[AzNIIRKh, Rostov-on-Don, USSR]

77-000087 Gregory, L. A.; Eales, J. G. FACTORS CONTRIBUTING TO HIGH LEVELS OF PLASMA IODIBE IN BROCK TROUT, /SALVELINUS FONTINALIS/ (MITCHILL). Can. J. Zool. 53 (3): 267-277. Mar. 1975. In English with French summ. SFA 22(1)
[Water Resour. Serv., Dep. Lands Forest Water Resour., Victoria, BC, Canada]

77-000088 Guernsey, D. L.; Poluhowich, J. J. BLOOD OXYGEN CAPACITIES OF EELS ACCLIMATED TO FRESH-, BRACKISH- AND SALT-WATER ENVIRONMENTS. Comp. Biochem. Physiol. A Comp. Physiol. 52 (2): 313-316. Oct. 1975. SFA 22(1)
[Dep. Zool., Univ. Hawaii, Edmondson Hall, 2538 The Mall, Honolulu 96822]

77-000089 Gupta, S.; Meske, Ch. ABNORMALITIES OF THE GONADS OF CARP. J. Fish. Biol. 9 (1): 75-77. July 1976. SFA 22(1)
[28 Bremen, Remberti ring-22, West Germany] /Cyprinus carpio/ is usually dioecious, with well-developed paired gonads (ovaries or testes) of which the two parts are approximately equal in weight. However, a few instances of abnormal development have been observed. In one male fish, the right testis developed normally to maturity, while the left testis was vestigial. In a female fish, only the right component of the ovary was present. Some monoecious, synchronous hermaphrodite specimens have also been observed, and self fertilization demonstrated experimentally. It has been shown that the progeny of such synchronous hermaphrodites may also have this characteristic. These studies demonstrate that even such a highly evolved teleost as the Carp may retain the primitive characteristic of hermaphroditism.

77-000090 Hamor, T.; Garside, E. T. REGULATION OF OXYGEN CONSUMPTION BY INCIDENT ILLUMINATION IN EMBRYONATED OVA OF ATLANTIC SALMON /SALMO SALAR/ L. Comp. Biochem. Physiol. A Comp. Physiol. 52 (2): 277-280. Oct. 1975. SFA 22(1)
[Dep. Biol., Dalhousie Univ., Halifax, NS, Canada]

77-000091 Hara, T. J. EFFECTS OF PH ON THE OLFACTORY RESPONSES TO AMINO ACIDS IN RAINBOW TROUT, /SALMO GAIRDNERI/. Comp. Biochem. Physiol. A Comp. Physiol. 54 (1): 37-39. 1976. SFA 22(1)
[Dep. Environ., Freshwater Inst., Winnipeg, MB R3T 2N6, Canada]

77-000092 Hara, T. J.; Macdonald, S. OLFACTORY RESPONSES TO SKIN MUCOUS SUBSTANCES IN RAINBOW TROUT /SALMO GAIRDNERI/. Comp. Biochem. Physiol. A Comp. Physiol. 54 (1): 41-44. 1976. SFA 22(1)
[Dep. Environ., Freshwater Inst., Winnipeg, MB R3T 2N6, Canada]

77-000093 Hara, T. J. STRUCTURE-ACTIVITY RELATIONSHIPS OF AMINO ACIDS IN FISH OLFACTION. Comp. Biochem. Physiol. A Comp. Physiol. 54 (1): 31-36. 1976. SFA 22(1)
[Dep. Environ., Freshwater Inst., Winnipeg, MB R3T 2N6, Canada]

77-000094 Harrington, R. W., Jr.; Crossman, E. A., Jr. EFFECTS OF TEMPERATURE AND SEX GENOTYPE ON MERISTIC COUNTS OF THE GONOCHORISTIC CYPRINODONTID FISH /RIVULUS CYLINDRACEUS/ POEY. Can. J. Zool. 54 (2): 245-254. Feb. 1976. In English with French summ. SFA 22(1)
[E. A. Crossman, Jr.: Fla. Med. Entomol. Lab., P.O. Box 520, Vero Beach 32960]

77-000095 Hattingh, J. THE INFLUENCE OF CARBON DIOXIDE ON THE BLOOD SUGAR CONCENTRATION IN THE FRESHWATER FISH, /LABEO CAPENSIS/ (SMITH). Comp. Biochem. Physiol. A Comp. Physiol. 53 (3): 235-236. 1976. SFA 22(1)
[Dep. Zool., Rand Afrikaans Univ., Johannesburg, South Africa] The Relationship between the percentage CO(2) in water and the blood glucose level in /L. capensis/ has been investigated. An increaese in CO(2) concentration in water results in a nonlinear increase in the blood sugar concentration. The results are discussed in light of the possible involvement of CO(2) as one cause of "asphyxiation hyperglycemia" in fish.

77-000096 Henderson, N. E.; Lorscheider, F. L. THYROXINE AND PROTEIN-BOUND IODINE CONCENTRATIONS IN PLASMA OF THE PACIFIC HAGFISH, /EPTATRETUS STOUTI/ (CYCLOSTOMATA). Comp. Biochem. Physiol. A Comp. Physiol. 51 (4): 723-726. Aug. 1975. SFA 22(1)
[Dep. Biol., Univ. Calgary, Calgary, AB T2N 1N4, Canada]

77-000097 Hettler, W. F. INFLUENCE OF TEMPERATURE AND SALINITY ON ROUTINE METABOLIC RATE AND GROWTH OF YOUNG ATLANTIC MENHADEN. J. Fish. Biol. 8 (1): 55-65. Jan. 1976. SFA 22(1)
[NMFS, Atl. Estuarine Fish. Cent., Beaufort, NC 28516] The experiments dealt primarily with routine metabolic rates of schooling juvenile Atlantic menhaden, /Brevoortia tyrannus/ (Latrobe), in flowing-water respirometers and were designed to obtain baseline data for energy flow models and studies on the effects of sublethal stresses. The relationship of body weight to oxygen consumption as well as the effect of temperature (10-25° C), salinity (low, 5-10 p.p.t. and high, greater than 28 p.p.t.), time since last fed and darkness on the routine metabolic rate was examined. The effect of salinity on growth of menhaden larvae into juveniles was also measured.

77-000098 Higgs, D. A.; Eales, J. G. INFLUENCE OF INJECTION ROUTE ON RADIOTHYROXINE KINETICS IN BROOK TROUT, /SALVELINUS FONTINALIS/ (MITCHILL). Can. J. Zool. 54 (2): 255-259. Feb. 1976. In English with French summ. SFA 22(1)
[Fish. Mar. Serv., 1460 Marine Dr., West Vancouver, BC V7V 1N6, Canada]

77-000099 Hinegardner, R. THE CELLULAR DNA CONTENT OF SHARKS, RAYS AND SOME OTHER FISHES. Comp. Biochem. Physiol. B Comp. Biochem. 55 (3): 367-370. 1976. SFA 22(1)
[Div. Nat. Sci., Univ. Calif., Santa Cruz 95064] The haploid amount of DNA was determined for 31 species of elasmobranchs and 8 other non-teleost fishes. The elasmobranchs have a modal DNA amount of about 4 pg, compared to 1 pg for the teleosts. The DNA content of the other non-teleosts ranges from 1.2 at the low end to 142 pg for lungfishes that have been assayed. Several characteristics that are common to DNA distributions in many different groups of organisms, such as a skewed distribution and the positive correlation between specialization and a

77-000099 CONTINUED
low amount of DNA, are apparent here. The lungfishes appear to be an exception to the latter characteristic.

77-000100 Hirose, K.; Tamaoki, B.; Fernholm, B.; Kobayashi, H. /IN VITRO/ BIOCONVERSIONS OF STEROIDS IN THE MATURE OVARY OF THE HAGFISH, /EPTATRETUS BURGERI/. Comp. Biochem. Physiol. B Comp. Biochem. 51 (4): 403-408. Aug. 1975. SFA 22(1)
[Takai Reg. Fish. Res. Lab., Arasaki, Nagai, Yokosuka 238-03, Japan]

77-000101 Hochachka, P. W. (ed.) PRESSURE EFFECTS ON BIOCHEMICAL SYSTEMS OF ABYSSAL AND MIDWATER ORGANISMS: THE 1973 KONA EXPEDITION OF THE /ALPHA HELIX/. Comp. Biochem. Physiol. B Comp. Biochem. 52 (1): 1-199. Sept. 1975. SFA 22(1)
[Dep. Zool., Univ. British Columbia, Vancouver 8, BC, Canada] A special issue containing 34 papers, many of these concerning abyssal fish, especially /Antimora rostrata/.--RS

77-000102 Holub, B. J.; Piekarski, J.; Cho, C. Y.; Slinger, S. J. INCORPORATION OF FATTY ACIDS INTO PHOSPHATIDYLCHOLINE BY ACYL-COA: 1-ACYL-/SN/-GLYCERO-3-PHOSPHORYLCHOLINE ACYLTRANSFERASE IN LIVER OF RAINBOW TROUT, /SALMO GAIRDNERI/. J. Fish. Res. Board Can. 33 (12): 2821-2826. Dec. 1976. In English with French summ. SFA 22(1)
[Dep. Nutr., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

77-000103 Houston, A. H.; Mearow, K. M.; Smeda, J. S. FURTHER OBSERVATIONS UPON THE HEMOGLOBIN SYSTEMS OF THERMALLY-ACCLIMATED FRESHWATER TELEOSTS: PUMPKINSEED (/LEPOMIS GIBBOSUS/), WHITE SUCKER (/CATOSTOMUS COMMERSONI/), CARP (/CYPRINUS CARPIO/), GOLDFISH (/CARASSIUS AURATUS/) AND CARP-GOLDFISH HYBRIDS. Comp. Biochem. Physiol. A Comp. Physiol. 54 (2): 267-273. 1976. SFA 22(1)
[Dep. Biol. Sci., Brock Univ., St. Catharines, ON L2S 3A1, Canada] Hematological response to temperature has been assessed in terms of total hemoglobin levels and the relative and actual abundancies of specific hemoglobin fractions in several freshwater species acclimated to constant temperature conditions. While only the pumpkinseed exhibited significant change in total hemoglobin content under the conditions employed, all species displayed quantitative changes in the actual and/or relative abundancies of one or more components of the hemoglobin system following thermal acclimation. In addition, the hemoglobin system of the goldfish was characterized by qualitative change in the sense that an additional minor fraction occurred at elevated temperature. While the variations observed are consistent with the hypothesis that these species may effect a form of adaptive hematological response through selective, quantitative alteration in their hemoglobin systems, confirmation will require the definition of transport characteristics under physiologically-realistic conditions.

77-000104 Ince, B. W.; Thorpe, A. THE EFFECTS OF STARVATION AND FORCE-FEEDING ON THE METABOLISM OF THE NORTHERN PIKE, /ESOX LUCIUS/ L. J. Fish. Biol. 8 (1): 79-88. Jan. 1976. SFA 22(1)
[Dep. Zool. Comp. Physiol., Queen Mary Coll., Univ. London, London E1 4NS, England] Starvation resulted in a reduction of liver and muscle glycogen and liver lipid. Blood glucose concentration and haematocrit were reduced, total plasma cholesterol levels were increased, while the levels of plasma free fatty acids (FFA), amino nitrogen and protein remained unaltered. No significant changes were

77-000104 CONTINUED
observed in either muscle protein, muscle water or the response to amino acid loading during the starvation period. The force-feeding of pike starved for 3 months resulted in liver lipid and muscle glycogen being increased to levels higher than those observed in freshly-captured fish. Liver glycogen, however, increases to values only slightly higher than those of starved animals. Furthermore, while force-feeding had little effect on plasma FFA or protein concentrations, blood glucose, plasma cholesterol and haematocrit returned to the levels found in freshly-captured fish and those of amino acid nitrogen were higher. The results indicate that pike are well adapted for periods of prolonged starvation and that hepatic and extra-hepatic lipid and glycogen stores serve for metabolic needs during food shortage, while body protein is conserved. The endocrine basis for theses changes in the tissue and blood constituents is discussed.--From abstr.

77-000105 Iriki, M.; Murata, S.; Nagai, M.; Tsuchiya, K. EFFECTS OF THERMAL STIMULATION TO THE SPINAL CORD ON HEART RATE IN CYPRINID FISHES. Comp. Biochem. Physiol. A Comp. Physiol. 53 (1): 61-63. 1976. SFA 22(1)
[Tokyo Metrop. Inst. Gerontol., 35-2, Sakaecho, Itabashiku, Tokyo-173, Japan] In Cyprinid fishes, indirect conductive warming and cooling of the spinal cord was performed by means of a thermode placed alongside the vertebral canal. Heart rate was chosen as the parameter to investigate the effects of spinal temperature changes on an autonomic effector system. Spinal cord warming increased and spinal cooling decreased heart rate. This neurally mediated cardiac response indicates the existence of thermosusceptive structures in the spinal cord.

77-000106 Jafri, A. K.; Shaffi, S. A. DISTRIBUTION OF ACID AND ALKALINE PHOSPHATASE ACTIVITY IN THE NORMAL ORGANS OF FRESHWATER TELEOST I--/OPHICEPHALUS PUNCTATUS/ BLOCH. Broteria Ser. Trimest. Cienc. Nat. 44 (1-2): 95-100. 1975. SFA 22(1)
[Dep. Zool., Aligarh Muslim Univ., Aligarh, India] The pattern of quantitative distribution of the acid and alkaline phosphatases in /O. punctatus/, a freshwater murrel, was found to differ from one organ to another and the characteristic seems linked with the functional differentiation of each organ. An inverse relationship was found to exist between the degree of activity of the two phosphatases in various organs. The alkaline phosphatase activity was highest in the kidneys while the highest acid phosphatase activity was observed in the liver. The possible functional significance of the two enzymes in various organs has been briefly discussed.--Summ.

77-000107 Jany, D.-K. STUDIES ON THE DIGESTIVE ENZYMES OF THE STOMACHLESS BONEFISH /CARASSIUS AURATUS GIBELIC/ (BLOCH): ENDOPEPTIDASES. Comp. Biochem. Physiol. B Comp. Biochem. 53 (1): 31-38. 1976. SFA 22(1)
[Ruhr-Univ. Bochum, Abteilung Chem., Lehrstuhl Biochem., D-4630 Bochum, Postfack 2148, West Germany] In the digestive system of /Carassius auratus gibelio/ trypsin- and chymotrypsin-like proteases were found, but no pepsin, no elastase and no collagenase. The occurrence of these enzymes as zymogenes in the hepatopancreas was shown. The endopeptidases are seryl-proteases. Unlike bovine trypsin and chymotryspin, the /Carassius/ endopeptidases are unstable below pH 6. The proteinases are not stabilized or activated by Ca-ions.

77-000108 Johnston, I. A. ANAEROBIC METABOLISM IN THE CARP (/CARASSIUS CARASSIUS/ L.). Comp. Biochem. Physiol. B Comp. Biochem. 51 (2): 235-241. June 1975. SFA 22(1)
[Univ. Bristol, Woodland Rd., Bristol BS8 1UG, England]

77-000109 Jordan, J. THE INFLUENCE OF BODY WEIGHT ON GAS EXCHANGE IN THE AIR-BREATHING FISH, /CLARIAS BATRACHUS/. Comp. Biochem. Physiol. A Comp. Physiol. 53 (3): 3-5-310. 1976. SFA 22(1)
[Dep. Zool., Univ. Fla., Gainesville 32611] The oxygen consumption of /Clarias batrachus/ varies as a function of weight and access to air. The metabolic rates of /Clarias/ in air and water with access to air are essentially the same, but the VO(2) of forcibly submerged fish is lower. /C. batrachus/ is a facultative air breather and at aquatic oxygen tensions exceeding 40 mm Hg, an oxygen regulator. Aerobic metabolism is primarily utilized during forcible submergence. The critical oxygen tension of /Clarias/ is proportional to body weight and about 1/3 the value for bimodally-breathing salamanders. The number of air breaths per unit of time doubles at night and is inversely proportional to body weight. The sensitivity of its naked skin to desiccation and the low bicarbonate buffering capacity of its blood limit the terrestrial activity of /Clarias/ to rainy nights when a cutaneous film of water can be maintained.

77-000110 Kaji, S.; Satou, M.; Kudo, Y.; Ueda, K.; Gorbman, A. SPECTRAL ANALYSIS OF OLFACTORY RESPONSES OF ADULT SPAWNING CHUM SALMON (/ONCORHYNCHUS KETA/) TO STREAM WATERS. Comp. Biochem. Physiol. A Comp. Physiol. 51 (4): 711-716. Aug. 1975. SFA 22(1)
[Bionics Res. Sect., Electrotech. Lab., Chiyoda-ku, tokyo, Japan] The frequency characteristics of the electrical responses to olfactory stimulation of spawning chum salmon, /Oncorhynchus keta/, induced by the nasal infusion of various stream waters were analyzed by a digital computer to investigate whether there is any recognizable neurophysiological coding in the discrimination of stream waters. Temporal changes in each frequency component were observed for individual induced responses; accordingly, "spectral patterns" seemed to characterize a quality of the stream waters. The analyses suggest that olfaction in migrating chum salmon is useful in discriminating among various stream waters. The coding mechanism in the olfactory function is discussed insofar as it is characterized by the spectral patterns of specific responses.

77-000111 Kalousdian, K. V.; Poluhowich, J. J. THE ROLE OF ORGANIC PHOSPHATES IN MODULATING THE OXYGENATION BEHAVIOR OF EEL HEMOGLOBIN. Comp. Biochem. Physiol. A Comp. Physiol. 53 (3): 245-248. 1976. SFA 22(1)
[Dep. Zool., Univ. N.H., Durham 03824]

77-000112 Kent, J. D.; Hart, R. G. THE EFFECT OF TEMPERATURE AND PHOTOPERIOD ON ISOZYME INDUCTION IN SELECTED TISSUES OF THE CREEK CHUB /SEMOTILUS ATROMACULATUS/. Comp. Biochem. Physiol. B Comp. Biochem. 54 (1): 77-80. 1976. SFA 22(1)
[Dep. Biol., Slippery Rock State Coll., Slippery Rock, PA 16057]

77-000113 Kerstetter, T. H.; Keeler, M. ON THE INTERACTION OF NH(4) AND NA FLUXES IN THE ISOLATED TROUT GILL. J. Exp. Biol. 64 (2): 517-527. Apr. 1976. SFA 22(1)
[Mar. Lab., Humboldt State Univ., Arcata, CA 95521]

77-000114 Kerstetter, T. H.; Mize, R. RESPONSES OF TROUT GILL ION TRANSPORT SYSTEMS TO ACUTE ACIDOSIS. J. Exp. Biol. 64 (2): 511-515. Apr. 1976. SFA 22(1)
[Mar. Lab., Humboldt State Univ., Arcata, CA 95521] The response of rainbow trout Na^+ and Cl^- uptake systems to acute acidosis was tested by slow infusion of lactic acid into anaesthetized animals. Depression of blood pH by 0.4 pH unit had no effect on influx rates for either ion, and we conclude that gill ion uptake systems do not respond rapidly to blood pH changes.

77-000115 Kheo, K. H. THE CORPUS LUTEUM OF GOLDFISH (/CARASSIUS AURATUS/ L.) AND ITS FUNCTIONS. Can. J. Zool. 53 (9): 1306-1323. Sept. 1975. In English with French summ. SFA 22(1)
[Sch. Biol. Sci., Univ. Malaysia, Penang, Malaysia]

77-000116 Klyashtorin, L. B.; Yarzhombek, A. A. SOME ASPECTS OF THE PHYSIOLOGY OF THE STRIPED BASS, /MORONE SAXATILIS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 985-989. 1975. SFA 22(1)
[VNIRO, Moscow, USSR] The dependence of metabolic changes of young striped bass, /Morone saxatilis/, on temperature, Salinity and oxygen content of the water was studied. The relationship between the rate of respiration and temperature is quite consistent with the "normal curve" common to poikilothermal animals. An increase in salinity up to 10 °/oo produces a short-term increase in oxygen consumption which is normalized as the fish adjust to the increased salinity. The size of the maintenance rations for young striped bass was calculated in relation to temperature and weight. Data are given on the critical and threshold concentrations of oxygen.

77-000117 Komourdjian, M. P.; Saunders, R. L.; Fenwick, J. C. THE EFFECT OF PORCINE SOMATOTROPIN ON GROWTH, AND SURVIVAL IN SEAWATER OF ATLANTIC SALMON (/SALMO SALAR/) PARR. Can. J. Zool. 54 (4): 531-535. Apr. 1976. In English with French summ. SFA 22(1)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF, Canada] The effects of porcine growth hormone on growth and salinity tolerance were studied in Atlantic salmon (/Salmo salar/) parr. Fish were held in freshwater at 11.5°C during June and July under a photoperiod with light to dark periods opposite to the prevailing natural conditions. Fish treated with 1.0 ug/g body weight of growth hormone preparation on alternate days were significantly longer (/P/ less than .05), after 4 weeks, than placebo-injected controls. All hormone-injected fish survived transfer to seawater, 30 °/oo. But under the same conditions, placebo-injected control fish showed a high mortality rate. Growth-hormone treatment caused a darkening of fin margins and a yellowing of the operculae and fin surfaces. The silvering which normally accompanies smoltification was not observed. The role of growth hormone in eliciting these actions and its possible role in the parr-smolt transformation are discussed.

77-000118 Komourdjian, M. P.; Saunders, R. L.; Fenwick, J. C. EVIDENCE FOR THE ROLE OF GROWTH HORMONE AS A PART OF A 'LIGHT-PITUITARY AXIS' IN GROWTH AND SMOLTIFICATION OF ATLANTIC SALMON (/SALMO SALAR/). Can. J. Zool. 54 (4): 544-551. Apr. 1976. In English with French summ. SFA 22(1)

[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF, Canada] Atlantic salmon (/Salmo salar/) parr were subjected to one of two photoperiod regimens: a simulated natural photoperiod, or a reciprocal photoperiod (with a light-to-dark ratio opposite to that of the natural photoperiod). The animals were held at 10°C from mid-December onward and were sampled at 3-week intervals. By February, salmon held under the reciprocal photoperiod were significantly longer, had lower condition factors, and looked and behaved more like smolts than did those under the natural photoperiod. A separate experiment showed that salinity tolerance increased at this time. In June the situation was reversed; the salmon kept under the natural photoperiod showed greatest growth and high salinity tolerance. Longer days in either regimen coincided with an increase in number and apparent activity of pituitary somatotrops of the animals. Adrenocorticotropin (ACTH), pars intermedia, and prolactin cells were also judged to be active under these conditions. A role for growth hormone and other peptides as components of a 'light-pituitary axis' is discussed in relation to the parr-smolt transformation of Atlantic salmon.

77-000119 Laale, H.; Law, P. Y.-H. AN IMMUNOLOGICAL STUDY OF THE EMBRYONIC STAGES OF THE ZEBRA FISH, /BRACHYDANIO RERIO/. I. PREHATCHING-STAGE ANTIGENIC PATTERNS. Can. J. Zool. 53 (3): 246-252. Mar. 1975. In English with French summ. SFA 22(1)

[Dep. Zool., Univ. Manitoba, Winnipeg, MB N3T 2N2, Canada] Seven developmental stages of zebra fish, /Brachydanio rerio/, namely, ovary, cleavage, high blastula, midgastrula, embryonic shield (11-12 h), optic cup, and hatching stages were analyzed by immunodiffusion and immunoelectrophoresis with unabsorbed and absorbed rabbit antisera to five prehatching developmental stages. The precipitin bands are discussed.

77-000120 Lam, T. J.; Pandey, S.; Nagahama, Y.; Hoar, W. S. EFFECT OF SYNTHETIC LUTEINIZING HORMONE-RELEASING HORMONE (LH-RH) ON OVULATION AND PITUITARY CYTOLOGY OF THE GOLDFISH /CARASSIUS AURATUS/. Can. J. Zool. 54 (6): 816-824. June 1976. In English with French summ. SFA 22(1)

[Dep. Zool., Univ. Singapore, Singapore 10] Synthetic luteinizing hormone-releasing hormone (LH-RH) induces ovulation and stimulates release of secretory granules from the pituitary gonadotrophs of goldfish kept at 12 ± 1°C, a temperature at which ovulation does not occur in control fish. Gonadal development is stimulated at doses too low to induce ovulation. Relatively high doses were required to induce ovulation: this may be related to the low experimental temperatures, although several other possibilities are discussed. Intracranial injections appeared to be only slightly more effective than intraperitoneal injections. A single type of gonadotroph containing two types of granules was identified at the ultrastructural level. Only the small, electron-dense granules are released after injection of synthetic LH-RH; the role of the large, less electron-dense granules is uncertain.

77-000121 Lampert, W. EXPERIMENTS ON THE RESISTANCE OF FISH TO RAPID INCREASE IN HYDROSTATIC PRESSURE. J. Fish. Biol. 8 (5): 381-383. May 1976. SFA 22(1)

[Limnol. Inst. Univ. Freiburg, 775 Konstanz-Egg, Mainaust. 212, West Germany] In a few hydro-electric pumping stations in the southern Black Forest it has been found that fish occurring in the high lying reservoirs could only arrive there from the river below after an upward transport through the pumping system. As there is a height difference of 400 m to overcome the fish must withstand a sudden pressure change of 40 atm. To test whether this is actually possible various species of fish were subjected suddenly to a pressure of 50 atm which was then reduced to 1 atm over a period of 10 min. No mortality occurred. Although the pressure shock symptoms exhibited by the different species of fish were variable, all appeared to be perfectly normal 2 h after the experiment.

77-000122 Law, P. Y.-H.; Laale, H. AN IMMUNOLOGICAL STUDY OF THE EMBRYONIC STAGES OF THE ZEBRA FISH, /BRACHYDANIO RERIO/. II. HATCHING-STAGE ANTIGENIC PATTERNS. Can. J. Zool. 53 (3): 253-261. Mar. 1975. In English with French summ. SFA 22(1)

[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada] Immunoelectrophoresis and immunodiffusion analyses were performed on the supernates of seven developmental stages of the zebra fish, /Brachydanio rerio/. The analytical agents were unabsorbed rabbit antiserum against hatching-stage extract, rabbit antisera against all stages (except ovary) absorbed with hatching-stage extract, and rabbit antiserum against hatching-stage extract absorbed respectively with extracts from each developmental stage (except ovary). The results are discussed and compared to the prehatching antigenic patterns reported for /Brachydanio rerio/.

77-000123 Leach, G. J.; Taylor, M. H. SEASONAL MEASUREMENTS OF SERUM GLUCOSE AND SERUM CORTISOL IN A NATURAL POPULATION OF /FUNDULUS HETEROCLITUS/ L. Comp. Biochem Physiol. A Comp. Physiol. 56 (2): 217-223. 1977. SFA 22(1)

[Dep. Biol. Sci., Univ. Del., Newark 19711] Seasonal measurements of serum glucose from field populations of /Fundulus heteroclitus/ reveal two peaks; one during the winter months which appeared to be temperature dependent and a second during the summer, correlated with the spawning season. Serum cortisol levels were measured using a radioimmunoassay procedure. No consistent seasonal trends were evident and, in general, cortisol levels were variable throughout the study. There were no statistically significant differences between male and female fish for either of the components measured. Serum cortisol levels were lower than those reported in the literature for this species and were not affected by fish size. There was no simple direct relationship between salinity and serum cortisol levels.

77-000124 leatherland, J. F.; Lin, L. ACTIVITY OF THE PITUITARY GLAND IN EMBRYO AND LARVAL STAGES OF COHO SALMON, /ONCORHYNCHUS KISUTCH/. Can. J. Zool. 53 (3): 297-310. Mar. 1975. In English with French summ. SFA 22(1)

[Dep. Zool., Univ. Guelph, Guelph, ON, Canada] Embryos of coho salmon appear to regulate their internal osmotic environment actively before hatching. However, at the time of hatching the pituitary contains only small numbers of differentiated cell types and it is only within the 1st week after hatching that a rudimentary follicular rostral pars distalis containing active eta (prolactin) acidophils becomes apparent. This suggests that prolactin, which in adult salmonids appears to be involved in freshwater osmo(iono)regulation,

77-000124 CONTINUED
may not be involved in the same way in the early larval stages. Late-stage coho alevins can withstand ambient salinities up to 65 percent seawater for a period of 3 to 4 days. Under these conditions the prolactin cells become less active than in similar fish acclimated to distilled water or well water. The data indicate that the endocrine regulation of freshwater osmo(iono)regulation in late alevins and early fry stages may be similar to that found in adults. The evidence for the involvement of other pituitary factors in the hydromineral regulation of coho fry in hypoosmotic or hyperosmotic environs is inconclusive. Morphological studies of the chorion of the egg and of the yolk sac of the embryo and alevin suggest that these organs are not actively involved in hydromineral regulation.

77-000125 Leatherland, J. F.; Hyder, M. EFFECT OF THYROXINE ON THE ULTRASTRUCTURE OF THE HYPOPHYSEAL PROXIMAL PARS DISTALIS IN /TILAPIA ZILLII/. Can. J. Zool. 53 (6): 686-690. June 1975. In English with French summ. SFA 22(1)
[Dep. Zool., Univ. Guelph, Guelph, ON, Canada]

77-000126 Legendre, P. A FIELD-TRIP MICROTECHNIQUE FOR STUDYING FISH LEUKOCYTE CHROMOSOMES. Can. J. Zool. 53 (10): 1443-1446. Oct. 1975. In English with French summ. SFA 22(1)
[Cent. Rech. Sci. Environ., Univ. Quebec, B.P. 8888, Montreal, PQ, Canada]

77-000127 Leggett, W. C.; O'Boyle, R. N. OSMOTIC STRESS AND MORTALITY IN ADULT AMERICAN SHAD DURING TRANSFER FROM SALTWATER TO FRESHWATER. J. Fish. Biol. 8 (6): 459-469. June 1976. SFA 22(1)
[Dep. Biol., McGill Univ., P.O. Box 6070, Stn. A, Montreal, PQ H3C 3G1, Canada] Thirty-five adult American shad (/Alosa sapidissima/) were moved quickly (2.5 h) from saltwater to freshwater. Changes in the levels of osmotically active blood constituents and of mortality were observed during and after the transfer. These were compared with levels of corresponding constituents and of mortality in 20 shad maintained in saltwater under similar conditions and to 44 shad sampled immediately after capture in saltwater and in freshwater (40 km from the saltwater-freshwater interface). Sodium and chloride levels in the blood of the transferred group declined sharply during and after transfer. Calcium, glucose and lactic acid levels increased, and potassium and magnesium levels remained stable. Transferred shad experienced heavy mortality beginning 5 h after the initial reduction in salinity associated with movement into freshwater. No mortality was experienced in the group held in saltwater. It was concluded that the extensive meandering exhibited by adult shad at the upper limit of the salt-freshwater interface during their spring migration in the Connecticut River is a behavioural response designed to slow the transition from the saltwater to the freshwater environment, thereby minimizing the physiological stress involved and/or allowing full recovery from this stress before proceeding upriver.

77-000128 Leray, C.; Bachand, L. ERYTHROCYTE METABOLISM IN THE YELLOW PERCH (/PERCA FLAVESCENS/ MITCHILL)--II. INTERMEDIATES, NUCLEOTIDES AND FREE ENERGY CHANGES IN GLYCOLYTIC REACTIONS. Comp. Biochem. Physicl. B Comp. Biochem. 51 (3): 349-353. July 1975. SFA 22(1)
[Lab. Physiol. Comp.-CNRS-BP 20CR 67037 Strasbourg Cedex, France]

77-000129 Leslie, J. M.; Buckley, J. T. PHOSPHOLIPID COMPOSITION OF GOLDFISH (/CARASSIUS AURATUS/ L.) LIVER AND BRAIN AND TEMPERATURE-DEPENDENCE OF PHOSPHATIDYL CHOLINE SYNTHESIS. Comp. Biochem. Physiol. B Comp. Biochem. 53 (3): 335-337. 1976. SFA 22(1)
[Dep. Bacteriol. Biochem., Univ. Victoria, Victoria, BC V8W 2Y2, Canada] The phospholipid distributions in goldfish liver and brain were determined by two dimensional thin layer chromatography. Phosphatidyl choline was the major phospholipid in both organs. Choline phosphotransferase activity was present in microsomal fractions from both liver and brain. The enzyme activity increased 3-fold as incubation temperature was raised from 20 to 30°C. the molecular species of phosphatidyl choline produced by liver choline phosphotransferase decreased in unsaturation as the temperature of incubation was increased from 10 to 30°C. This suggests a possible mechanism by which tissue phospholipid fatty acids could be altered in response to changes in temperature.

77-000130 Lester, R. J. G.; Desser, S. S. ULTRASTRUCTURAL OBSERVATIONS ON THE GRANULOCYTIC LEUCOCYTES OF THE TELEOST /CATOSTOMUS COMMERSONI/. Can. J. Zool. 53 (11): 1648-1657. Nov. 1975. In English with French summ. SFA 22(1)
[Dep. Microbiol. Parasitol., Fac. Med., Univ. Toronto, Toronto, ON M5S 1A1, Canada]

77-000131 Malyusz, M.; Thiemann, V. THE EFFECT OF UREA, THIOUREA AND ACETAMIDE ON THE RENAL AND BRANCHIAL ENZYME-PATTERN OF THE DOGFISH /SCYLIORHINUS CANICULA/. Comp. Biochem. Physiol. B Comp. Biochem. 54 (1): 177-179. 1976. SFA 22(1)
[Physiol. Inst. Univ., Lehrstuhl II, D-23 Kiel 1, Olshausenstrasse 40/60, Germany]

77-000132 Marquez, E. D. A COMPARISON OF GLUTAMIC-OXALACETATE TRANSAMINASE, LACTATE DEHYDROGENASE, ALPHA-HYDROXYBUTYRATE DEHYDROGENASE, AND CREATING PHOSPHOKINASE ACTIVITIES IN NON-SPAWNING, PRE-SPAWNING, AND SPAWNING PINK SALMON. Comp. Biochem. Physiol. B Comp. Biochem. 54 (1): 121-123. 1976. SFA 22(1)
[Dep. Microbiol., Milton S. Hershey Med. Cent., Pa. State Univ., Hershey 17033] The activity levels of various enzymes were assayed in the serum of non-spawning, pre-spawning, and spawning salmon. The enzymes, often used in the diagnosis of degenerative diseases in humans, included glutamic-oxalacetate transaminase, lactate dehydrogenase, alpha-hydroxybutyrate dehydrogenase, and creatine phosphokinase. The activity levels of all enzymes were highest in spawning salmon as compared to non-spawning salmon. In other fish sera, the enzyme activity levels for all enzymes were highest in Pacific herring while sera from dogfish, ling cod, and red rock fish had activity levels approaching those found in normal human serum. Polyacrylamide disc-gel electrophoresis of spawning salmon lactate dehydrogenase isoenzymes showed a diversity of enzyme patterns. This suggests that LDH activity can vary considerably from fish to fish.

77-000133 Mashiter, K. E.; Morgan, M. R. J. CARBONIC ANHYDRASE LEVELS IN THE TISSUES OF FLOUNDERS ADAPTED TO SEA WATER AND FRESH WATER. Comp. Biochem. Physiol. A Comp. Physiol. 52 (4): 713-717. Dec. 1975. SFA 22(1)
[M. R. J. Morgan: Dep. Biol. Sci., Univ. Lancaster, Bailrigg, Lancaster, England]

77-000134 Matey, V. Ye. THE REACTION OF THE HYPOTHALAMIC-HYPOPHYSEAL NEUROSECRETORY SYSTEM OF THE GUPPY (/LEBISTES RETICULATUS/) TO AN ALTERATION OF AMBIENT TEMPERATURE. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 775-781. 1975. SFA 22(1)
[Inst. Biol. Inland Waters, USSR Acad. Sci., Borok, USSR] An investigation has been made of the influence of increase and reduction in the ambient temperature on the functional activity of the hypothalamic-hypophyseal neurosecretory system (HHNS) of the guppy (/Lebistes reticulatus/). It is demonstrated that a 10° reduction of temperature causes inhibition of the functional activity of the hypothalamus-pituitary system accompanied by deposition of neurosecretion in all its parts. The reaction of the HHNS to an increase of temperature is of a biphasic nature. Cellular elements are shown to play an active part in development of the stress reaction induced by a thermal stimulus.

77-000135 Matyukhin, V. A.; Neshumova, T. V.; Dement'yev, Ya. V. TEMPERATURE CHANGES OF THE RED AND WHITE MUSCLES OF THE BAIKAL GRAYLING (/THYMALLUS ARCTICUS BAICALENSIS/) AT DIFFERENT SWIMMING SPEEDS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 794-798. 1975. SFA 22(1)
[Inst. Physiol., Siberian Br. Acad. Med. Sci., Novosibirsk, USSR] This study concerned temperature change of the red and white muscles of the Baikal grayling (/Thymallus arcticus baicalensis/) measured at swimming speeds and in the recovery period. Temperature increment in the red and white muscles is dependent on the strength of the loading and the manner of its application and on the time from commencement of swimming. The temperature increment increases uniformly in the red muscles as swimming increases, from 0.010 to 0.081°, but in the white muscles it is increased only at speeds exceeding 87 cm/sec (to 0.033°). In the recovery period the temperature increment in the red muscles declined rapidly to 0.030°--no reduction of temperature in white muscle was observed for 15 min.

77-000136 Mayer-Gostan, N.; Hirano, T. THE EFFECTS OF TRANSECTING THE IXTH AND XTH CRANIAL NERVES ON HYDROMINERAL BALANCE IN THE EEL /ANGUILLA ANGUILLA/. J. Exp. Biol. 64 (2): 461-475. Apr. 1976. SFA 22(1)
[Dep. Biol., Stn. Zool., 06230 Villefranche-sur-Mer, France] The IXth and the Xth cranial nerves in /Anguilla anguilla/ were transected, and the effects upon ion and water balance were studied in fresh water and sea water, and during transfer from fresh water to sea water and /vice versa/. In fresh water there is a slow demineralization due to an excess loss of Na and Cl ions. During freshwater to seawater transfer the eel survives only for 4-5 days. The fish do not drink and Na efflux does not increase enough to extrude excess ions. In sea water the glossopharyngeal and vagus nerves are necessary for the maintenance of the hydromineral balance. Denervation is followed by an increase in plasma ion concentrations. Na fluxes are not modified and increased water loss is not compensated by drinking. The rapid reduction of Na efflux during transfer from sea water to fresh water is not modified by denervation.

77-000137 McCartney, T. H. SODIUM-POTASSIUM DEPENDENT ADENOSINE TRIPHOSPHATASE ACTIVITY IN GILLS AND KIDNEYS OF ATLANTIC SALMON (/SALMO SALAR/). Comp. Biochem. Physiol. A Comp. Physiol. 53 (4): 351-353. 1976. SFA 22(1)

[U.S. FWS, Tunison Lab. Fish Nutr., Cortland, NY 13045] Gill and kidney ATPase activities of 2-year-old Atlantic salmon (/Salmo salar/) were determined periodically from March to July. Na-K ATPase activity increased in the gill and declined in the kidney during the time encompassing transformation of parr to smolt under hatchery conditons.

77-000138 McLeay, D. J. VARIATIONS IN THE PITUITARY-INTERRENAL AXIS AND THE ABUNDANCE OF CIRCULATING BLOOD-CELL TYPES IN JUVENILE COHO SALMON, /ONCORHYNCHUS KISUTCH/, DURING STREAM RESIDENCE. Can. J. Zool. 53 (12): 1882-1891. Dec. 1975. In English with French summ. SFA 22(1)

[Dep Zool., Univ. British Columbia, Vancouver, BC, Canada] According to histological and histometric indices, the pituitary-interrenal axis of juvenile coho salmon residing in a natural stream was inactive in postalevin fry sampled in the spring, and in summer and fall samples of fingerlings, compared with a December sample or with smolts captured the next spring. Interrenal nuclear diameters, interrenal cell size, and epsilon (adrenocorticotropin) cell nuclear diameters were highly positively correlated. The numbers of circulating small lymphocytes and thrombocytes were highest in summer samples. Numbers of circulating large lymphocytes and neutrophils (per thousand cells of all types) were small and did not differ from sample to sample. Histometric indices of pituitary-interrenal axis activity were negatively correlated with numbers of circulating small lymphocytes but were unrelated to thrombocyte counts. Water temperature during sampling was highly negatively correlated with interrenal number and cell size and epsilon-cell nuclear diameters, and positively correlated with small lymphocyte and thrombocyte counts. It was concluded that the pituitary-interrenal axis in juvenile coho salmon was activated by both cold-temperature acclimation and smoltification. Unlike thrombocytes, the seasonal variations in numbers of circulating small lymphocytes were attributed to adrenocortical secretory activity.

77-000139 Meakins, R. H. THE EFFECTS OF ACTIVITY AND SEASON ON THE RESPIRATION OF THE THREE-SPINED STICKLEBACK, /GASTEROSTEUS ACULEATUS/ L. Comp. Biochem. Physiol. A Comp. Physiol. 51 (1): 155-157. May 1975. SFA 22(1)

[Dep. Parasitol., Fac. Med., Univ. Dar es Salaam, Dar es Salaam, Tanzania] The relationship between body weight and respiration rate is demonstrated at three levels of activity. The maximum (active) respiration rate is twice the routine and five times the minimum for February. Fish in August show increased respiration and scope for activity. Acclimation to summer conditions enables /Gasterosteus aculeatus/ to increase its activity during times of courtship and parental care behaviour.

77-000140 Meakins, R. H. VARIATIONS IN THE ENERGY CONTENT OF FRESHWATER FISH. J. Fish. Biol. 8 (3): 221-224. Mar. 1976. SFA 22(1)

[Dep. Parasitol. Entomol., Univ. Dar es Salaam, P.O. Box 20693, Dar es Salaam, Tanzania] The calorific value of the three-spined stickleback, /Gasterosteus aculeatus/, varied with its size, sex and the season. Fish of 16 mg dry weight had a value of 1950 cal/g while for fish of 313 mg the value was 470 cal/g. The calorific value of gravid females was 23 percent above that of males of comparable size. The calorific value of a tropical cichlid, /Tilapia nilotica/, with a dry weight of 11 g was 4300 cal/g, the calorific values of the tissues ranged from 2500 cal/g for bone to 5190 cal/g for muscle.

77-000141 Milne, R. S.; Randall, D. J. REGULATION OF ARTERIAL PH DURING FRESH WATER TO SEA WATER TRANSFER IN THE RAINBOW TROUT /SALMO GAIRDNERI/. Comp. Biochem. Physiol. A Comp. Physiol. 53 (2): 157-160. 1976. SFA 22(1)

[Zool. Dep., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada] Plasma [Cl^-], [$HCO(3)^-$], arterial blood pCO(2), and pH and CO(2) excretion were not affected by transfer of trout from fresh water to sea water. Carbonic anhydrase activity in the trout gill epithelium is low compared with that for goldfish and sea water coho salmon, but similar to fresh water coho salmon. The results are discussed in relation to various models for ion transport across the fish gill and it is concluded that a $Cl^-/HCO(3)^-$ exchange mechanism is reduced in the gill epithelium of trout compared with that of the goldfish.

77-000142 Narayansingh, T.; Eales, J. G. EFFECTS OF THYROID HORMONES ON /IN VIVO/ 1-^{14}C L-LEUCINE INCORPORATION INTO PLASMA AND TISSUE PROTEIN OF BROOK TROUT (/SALVELINUS FONTINALIS/) AND RAINBOW TROUT (/SALMO GAIRDNERI/). Comp. Biochem. Physiol. B Comp. Biochem. 52 (3): 399-405. Nov. 1975. SFA 22(1)

[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

77-000143 Natochin, Yu. V.; Luk'yanenko, V. I.; Lavrova, Ye. A.; Metallov, G. F. CATION CONTENT OF THE BLOOD SERUM DURING THE MARINE AND RIVER PERIODS IN THE LIFE STURGEONS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 799-804. 1975. SFA 22(1)

[I. M. Sechenov Inst. Evol. Physiol. Biochem., USSR Acad. Sci., Lenningrad, USSR] The range of variation of sodium concentration in the blood serum of sturgeons in freshwater and seawater is 124-142 meq/liter, that of potassium is 2.4-4.3, that of calcium 3.4-7.4 and that of magnesium 1.7-3.8 meq/liter. The lowest concentration of cations is a feature of sturgeons held in hatcheries for a long time. The concentration of cations in the blood of the sevryuga and the sterlet is similar to the values found in the Russian sturgeon. Comparison of ionograms of the blood serum of sturgeons and of Caspian water indicate the specific nature of the functioning of the ion-regulating systems of these fishes, in as much as appreciable differences between sea water and their blood are a feature only of bivalent cations.

77-000144 Nayyar, S. K.; Keshavanath, P.; Sundararaj, B. I.; Donaldson, E. M. MAINTENANCE OF SPERMATOGENESIS AND SEMINAL VESICLES IN THE HYPOPHYSECTOMIZED CATFISH, /HETEROPNEUSTES FOSSILIS/ (BLOCH): EFFECTS OF OVINE AND SALMON GONADOTROPIN, AND TESTOSTERONE. Can. J. Zool. 54 (2): 285-292. Feb. 1976. In English with French summ. SFA 22(1)
[Dep. Zool., Univ. Delhi, Delhi 110007, India]

77-000145 Nordlie, F. G. INFLUENCE OF ENVIRONMENTAL TEMPERATURE ON PLASMA IONIC AND OSMOTIC CONCENTRATIONS IN /MUGIL CEPHALUS/ LIN. Comp. Biochem. Physiol. A Comp. Physiol. 55 (4): 379-381. 1976. SFA 22(1)
[Dep. Zool., Univ. Fla., Gainesville 32611] Plasma Na^+ in /Mugil cephalus/ ranged from a concn of 158.8 ± 1.1 m-equiv/l from fish acclimated to 10°C to 178.0 ± 2.2 m-equiv/l from fish at 30°C, plasma Cl^- ranged from 138.8 ± 0.9 m-equiv/l at 10°C to 158.2 ± 2.1 m-equiv/l at 30°C and plasma osmotic concentration ranged from 323 mOsm/kg to 378 mOsm/kg for the same acclimation temperature range. Plasma K^+ remained roughly constant. These patterns of response in inorganic ions and total osmotic concentrations to environmental temperature are opposite to what one would expect in fishes acclimated to sea water and would seem to involve an additional metabolic expenditure for regulation at lowered temperatures.

77-000146 Nordlie, F. G.; Leffler, C. W. IONIC REGULATION AND THE ENERGETICS OF OSMOREGULATION IN /MUGIL CEPHALUS/ LIN. Comp. Biochem. Physiol. A Comp. Physiol. 51 (1): 125-131. May 1975. SFA 22(1)
[Dep. Zool., Univ. Fla., Gainesville, 32611] The regulation of Na^+, K^+ and Cl^- were evaluated in /Mugil cephalus/ Lin over a range of ambient concentrations from 20 to 1570 mOs/l. K^+ and Cl^- concentrations decrease only slightly with decreased ambient concentration below 600 mOs/l. K^+ showed no significant alteration over the experimental range. The energetic cost of the osmotic regulatory process was evaluated. The cost of osmotic regulation is high when the environment is distinctly hyperosmotic with respect to the blood. The cost is negligible when the environmental concentration is less than that of the blood. Problems of homeostatic maintenance in this form are discussed.

77-000147 Oduleye, S. O. THE EFFECTS OF HYPOPHYSECTOMY, PROLACTIN THERAPY AND ENVIRONMENTAL CALCIUM ON ELECTROLYTE BALANCE OF THE BROWN TROUT /SALMO TRUTTA/, L. J. Exp. Biol. 64 (1): 221-231. Feb. 1976. SFA 22(1)
[Dep. Zool., Univ. Ibadan, Ibadan, Nigeria] Adaptation of the brown trout to fresh water containing increasing concentrations of calcium resulted in a decrease in plasma electrolyte level and total electrolyte excretion. The electrolyte excretion rate was higher at the beginning than at the end of the urine collection periods. Hypophysectomized fish had a lower plasma electrolyte concentration than the controls. This deficiency was partially corrected by prolactin therapy. High environmental calcium was only effective to a limited extent. There was no difference in the normal renal sodium output between hypophysectomized and intact fish in fresh water. Environmental calcium did not have any significant effect on renal electrolyte output of hypophysectomized fish.

77-000148 Ooi, E. C.; Youson, J. H. GROWTH OF THE OPISTHONEPHRIC KIDNEY DURING LARVAL LIFE IN THE ANADROMOUS SEA LAMPREY, /PETROMYZON MARINUS/ L. Can. J. Zool. 54 (9): 1449-1458. Sept. 1976. In English with French summ. SFA 22(1)
[Dep. Zool., Scarborough Coll., Univ. Toronto, West Hill, ON, Canada]

77-000149 Opdyke, D. F.; Cook, J. E.; Rausch, A. THE VASCULAR VOLUME-PRESSURE RELATIONSHIP IN THE DOGFISH, /SQUALUS ACANTHIAS/. Comp. Biochem. Physiol. A Comp. Physiol. 51 (2): 431-437. June 1975. SFA 22(1)
[Mt. Desert Island Biol. Lab., Salisbury Cove, ME 04672]

77-000150 Page, J. W.; Andrews, J. W.; Murai, T.; Murray, M. W. HYDROGEN ION CONCENTRATION IN THE GASTROINTESTINAL TRACT OF CHANNEL CATFISH. J. Fish. Biol. 8 (3): 225-228. Mar. 1976. SFA 22(1)
[Univ. Ga., P.O. Box 13687, Savannah 31406] Hydrogen ion concentrations (pH) of the digestive tracts of channel catfish were determined for fish of two sizes (892 and 134 g average weight) at two environmental temperatures (28 and 23 C). Acidic conditions (pH 2-4) were present in the stomach contents of all catfish with slightly higher pH values in stomachs of fish at 28° C. The pH increased to slightly alkaline values (pH 7-9) in the duodenum and reached a maximum level (pH 8.6) in the upper intestinal region and then decreased in the lower segments to approach neutrality in the colon. The pH of the bile ranged from 6.1 to 7.5 and was higher in fish maintained at 28° C. Higher environmental temperatures (28° C) resulted in a slightly lower pH throughout the intestinal and colon segments. The larger catfish had lower intestinal length/body weight ratios than smaller catfish. As the result of distension due to increased food consumption, catfish maintained at 28° C had shorter intestinal tracts than catfish maintained at 23° C.

77-000151 Perez, J. E.; Maclean, N. MULTIPLE GLOBINS AND HAEMOGLOBINS IN THE BASS, /DICENTRARCHUS LABRAX/ (L.) (SERRANIDAE: TELEOSTEI). J. Fish. Biol. 8 (5): 413-417. May 1976. SFA 22(1)
[Dep. Biol., Univ. Oriente, Cumana, Venezuela] The haemoglobins and globins of bass, /Dicentrarchus labrax/ (L.) have been studied by starch and polyacrylamide gel electrophoresis. Five haemoglobin components were found. These haemoglobins appear to result from the combination of four different globin monomers. The molecular weight of the pooled haemoglobin is about 54,400, confirming its tetrameric form. The evolutionary significance of multiple haemoglobins is discussed.

77-000152 Perez, J. E.; Maclean, N. MULTIPLE GLOBINS AND HAEMOGLOBINS IN FOUR SPECIES OF GREY MULLET (MUGILIDAE, TELEOSTA). Comp. Biochem. Physiol. B Comp. Biochem. 53 (4): 465-468. 1976. SFA 22(1)
[Dep. Biol., Univ. Oriente, Cumana, Venezuela] /Mugil curema/ and /M. brasiliensis/ have identical haemoglobin patterns, composed of three haemoglobin components. /Crenimugil labrosus/ and /Liza aurata/ possess seven haemoglobin components, and the pattern of electrophoretic migration is similar in both species. /M. curema/ and /M. brasiliensis/ possess three different globins. /C. labrosus/ and /L. aurata/ possess five different globins. Only one globin seems to be common to both groups. Evolutionary significance of multiple haemoglogins in fish is discussed.

77-000153 Peterson, A. J.; Pcluhowich, J. J. THE EFFECTS OF ORGANIC PHOSPHATES ON THE OXYGENATION BEHAVIOR OF EEL MULTIPLE HEMOGLOBINS. Comp. Biochem. Physiol. A Comp. Physiol. 55 (4): 351-354. 1976. SFA 22(1)

[Dep. Zool., Univ. Ark., Fayetteville 72701] The effects of guanosine triphosphate (GTP) and adenosine triphosphate (ATP) on the oxygenation behavior of the two major hemoglobins of the American eel, /Anguilla rostrata/, were determined. Both phosphates lower the oxygen affinities of the individual hemoglobins but the effect of GTP is greater than that of ATP. The allosteric effect of these phosphates is more pronounced with HbI than with HbII. Combination of GTP and ATP at intraerythrocytic concentrations lower the oxygen affinities of the pigments to a greater extent than either phosphate alone. Sodium chloride decreases the affinity of HbI but increases the affinity of HbII. The interaction between these phosphates and NaCL in modulating the oxygenation behavior of the multiple hemoglobins of marine and fresh-water eels is discussed.

77-000154 Pfeiler, E. GILL ATPASE ACTIVITIES IN THE SMALLMOUTH BASS (/MICROPTERUS DOLOMIEUI/). Comp. Biochem. Physiol. B Comp. Biochem. 53 (1): 119-121. 1976. SFA 22(1)

[Univ. Autonoma de Baja California, Unidad de Ciencias Marinas, Ensenada, Baja California, Mexico] MgATPase activity in bass gill microsomes was relatively stable to preincubation at 37°C but activity decreased after preincubation at 45°C. At an assay temperature of 13°C, Na-ATPase activity could not be demonstrated after 37°C preincubation but was evident after preincubation at 45°C. At an assay temperature of 37°C, addition of Na^+ resulted in a decrease in ATPase activity. Ouabain-sensitive NaK-ATPase activity could be demonstrated at both assay temperatures.

77-000155 Phleger, C. F.; Holtz, R. B.; Grimes, P. W. MEMBRANE BIOSYNTHESIS IN SWIMBLADDERS OF DEEP SEA FISHES /CORYPHAENOIDES ACROLEPIS/ AND /ANTIMORA ROSTRATA/. Comp. Biochem. Physiol. B Comp. Biochem. 56 (1): 25-30. 1977. SFA 22(1)

[Dep. Phys. Sci. Oceanogr., San Diego State Univ., San Diego, CA 92182]

77-000156 Potter, I. C.; Brown, I. D. CHANGES IN HAEMOGLOBIN ELECTROPHEROGRAMS DURING THE LIFE CYCLE OF TWO CLOSELY RELATED LAMPREYS. Comp. Biochem. Physiol. B Comp. Biochem. 51 (4): 517-519. Aug. 1975. SFA 22(1)

[Sch. Biol. Sci., Univ. Bath, Claverton Down, Bath BA2 7A, Avon, England] Polyacrylamide gel electrophoresis showed that the haemoglobins of ammocoete and sexually mature adults of the non-parasitic lamprey, /Lampetra planeri/, exhibited identical mobility to those in comparable stages of the proposed ancestral species, /Lampetra fluviatilis/. Five bands were seen in electropherograms from ammocoetes, with only the fastest migrating trace band having the same mobility as that of any of the three components observed in the adult. Despite the much shorter post-larval period in /L. planeri/, the adult haemoglobins replaced those of the ammocoete more rapidly in /L. fluviatilis/, a feature that may be correlated with differences in the ecology of the metamorphosing stages of the two species.

77-000157 Pye, V. I.; Wieser, W.; Zech, M. THE EFFECT OF SEASON AND EXPERIMENTAL TEMPERATURE ON THE RATES OF OXIDATIVE PHOSPHORYLATION OF LIVER AND MUSCLE MITOCHONDRIA FROM THE TENCH, /TINCA TINCA/. Comp. Biochem. Physiol. B Comp. Biochem. 54 (1): 13-20. 1976. SFA 22(1)
[Inst. Zoophysiol., Univ. Innsbruck, Innsbruck, Austria]

77-000158 Rakusa-Suszczewski, S.; McWhinnie, M. A. RESISTANCE TO FREEZING BY ANTARCTIC FAUNA: SUPERCOOLING AND OSMOREGULATION. Comp. Biochem. Physiol. A Comp. Physiol. 54 (3): 291-300. 1976. SFA 22(1)
[Nenchi Inst. Exp. Biol., Warsaw, Poland] Body fluids of six antarctic invertebrates are hyperosmotic to their normal environmental sea water during the late austral summer and winter. Pelagic and benthic species respond as osmoconformers to changes in salinity but regulate slightly hyperosmotically when returned to normal sea water. Adjustment of the amphipod /Orchomene plebs/ Hurley to a concentration gradient requires a small but significant increase in energy output. Tolerance to supercooling and the extent of hyperosmotic regulation is greater in pelagic than in benthic species. Body fluids of antarctic invertebrates show equilibrium freezing points similar to ideal solutions while blood serum of the fish /Trematomus bernacchi/ shows marked thermal hysteresis. The role of these resistance adaptations of antarctic marine fauna is discussed.

77-000159 Rasskazov, V. A.; Nesterenko, V. F.; Galkin, V. V. A STUDY OF SOME PROPERTIES OF CHROMATIN AND SPECTRUM OF HISTONES IN THE LIVER CELLS OF SPAWNING /ONCORHYNCHUS GORBUSHA/ (WALB.). Comp. Biochem. Physicl. B Comp. Biochem. 53 (2): 149-154. 1976. SFA 22(1)
[Pac. Inst. Bioorgan. Chem., Far East Sci. Cent., Acad. Sci. USSR, Vladivostok--22, USSR]

77-000160 Read, L. J. ABSENCE OF UREOGENIC PATHWAYS IN LIVER OF THE HAGFISH /EPTATRETUS CIRRHATUM/. Comp. Biochem. Physiol. B Comp. Biochem. 51 (1): 139-141. May 1975. SFA 22(1)
[Dep. Zool., Univ. Canterbury, Christchurch, New Zealand]

77-000161 Reynolds, W. W.; McCauley, R. W.; Casterlin, M. E.; Crawshaw, L. I. BODY TEMPERATURES OF BEHAVIORALLY THERMOREGULATING LARGEMOUTH BLACKBASS (/MICROPTERUS SALMOIDES/). Comp. Biochem. Physiol. A Comp. Physiol. 54 (4): 461-463. 1976. SFA 22(1)
[Pa. State Univ., Wilkes-Barre 18708] Five largemouth blackbass, ranging from 50 to 460 g body weight, were allowed to behaviorally thermoregulate in an electronic device which permitted them to regulate the water temperature. Mean gut temperatures over a 12-hr period did not differ significantly from mean occupied temperatures or from mean water temperatures.

77-000162 Reynolds, W. W.; Thomson, D. A.; Casterlin, M. E. TEMPERATURE AND SALINITY TOLERANCES OF LARVAL CALIFORNIAN GRUNION, /LEURESTHES TENUIS/ (AYRES): A COMPARISON WITH GULF GRUNION, /L. SARDINA/ (JENKINS & EVERMANN). J. Exp. Mar. Biol. Ecol. 24 (1): 73-82. 1 Oct. 1976. SFA 22(1)
[Dep. Biol., Pa. State Univ., Wilkes-Barre] Temperature and salinity tolerances were determined for larval California grunion, /Leuresthes tenuis/ (Ayres), and compared with previous data for Gulf of California grunion, /L. sardina/ (Jenkins & Evermann). Larvae of similar age and acclimation history showed little interspecific difference in thermal tolerance, as measured by half-hour LT(50) values for 20-30 day old late postlarvae acclimated at various

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temperatures, and by upper and lower incipient lethal temperatures for 18C-acclimated prolarvae. The upper incipient lethal temperature differed by 1 deg.-C (32C for /L. tenuis/, 31C for /L. sardina/), while the lower incipient lethal temperature for the 18C acclimated prolarvae of both species was 7.5C. /L. tenuis/ larvae were much less euryhaline than /L. sardina/, with incipient lethal salinities of 4.2-41°/oo for prolarvae and 8.6-38°/oo for 20-day-old postlarvae; comparable values for /L. sardina/ are 4-67.5°/oo and 5-57.5°/oo. Both species show a decrease in temperature and salinity tolerance with age. The larvae of these disjunct congeners show a significant physiological divergence in euryhalinity but not in overall temperature tolerance. These tolerances are discussed in relation to the respective geographic ranges and behavioral responses of the two species.

77-000163 Reynolds, W. W. THERMAL EQUILIBRATION RATES IN RELATION TO HEARTBEAT AND VENTILATORY FREQUENCIES IN LARGEMOUTH BLACKBASS, /MICROPTERUS SALMOIDES/. Comp. Biochem. Physiol. A Comp. Physiol. 56 (2): 195-201. 1977. SFA 22(1)
[Pa. State Univ., Wilkes-Barre, PA] Relative heating and cooling rates were determined simultaneously with heart and opercular beat rates in bass subjected to sudden increases or decreases of 10-20°C in ambient water temperature. Cooling rates exceeded heating rates up to 90 percent of the equilibrium temperature, but equilibrium was usually reached sooner during heating. Heart and opercular beat rates were closely synchronized (1:1) during heating and cooling. Heart and opercular beat rates were greater for a given temperature during heating than during cooling; however, the initially greater rates during cooling may contribute to initially faster cooling.

77-000164 Ross, S. EFFECTS OF HYPERBARIC PRESSURE ON OXYGEN CONCENTRATION IN THE SWIM BLADDER OF /POECILIA LATIPINNA/. J. Fish. Biol. 8 (1): 1-4. Jan. 1976. SFA 22(1)
[Dep. Anaesthesia, Univ. Calif. Sch. Med., San Francisco 94143] /Poecilia latipinna/ was subjected to varying hydrostatic pressures in the laboratory which demonstrated the following points. The hyperbaric chamber is a suitable apparatus for testing gas gland secretion in this teleostean fish. Oxygen concentration within the swim bladder increased with increasing hydrostatic pressure. Pressures encountered by fishes at various levels of the water column and their effects on oxygen concentration in the swim bladder may be simulated in the laboratory.

77-000165 Ryland, J. S.; Nichols, J. H. EFFECT OF TEMPERATURE ON THE EMBRYONIC DEVELOPMENT OF THE PLAICE, /PLEURONECTES PLATESSA/ L. (TELEOSTEI). J. Exp. Mar. Biol. Ecol. 18 (2): 121-137. June 1975. SFA 22(1)
[Dep. Zool., Univ. Coll. Swansea, Swansea, Wales] In normal years, Eggs and prolarvae of the plaice (/Pleuronectes platessa/ L.) in the southern North Sea develop within the temperature range 6.0-8.5°C, although the water may at times be some degrees colder or warmer than this. The effect of temperature, t °C, on the embryonic development time, D days, has been investigated within the tolerated range 2.8-10.5°C. Various models to express the observed curvilinear relationship between t and D have been considered, that giving the closest fit to the data being $(t - t(0))(D - D(0)) = k$ or $D = k/(t - t(0)) + D(0)$. A method is given for the calculation of constants k, D(0), and t(0). The relationship may also be expressed by the equation $D = a(t - t(0))$ to the b where a and b are constants, but t(0) must in this case be found by iteration. At investigated temperatures in the

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range 4.1-10.5°C the smallest eggs in a batch from a single source hatched first. Within the tolerated range, hatching prolarvae were substantially smaller at 10.5°C than at the other temperatures. During the period of prolarval yolk utilization, growth is slower at the high temperatures, so that median temperatures of 6.5-8.0°C are most efficient in terms of the relationship between growth in length and yolk utilization. Toward the end of the yolk-sac phase, the rate of yolk utilization declines unless a suitable external food source (e.g., /Artemia/ nauplii) is provided.

77-000166 Satou, M.; Ueda, K. SPECTRAL ANALYSIS OF OLFACTORY RESPONSES TO AMINO ACIDS IN RAINBOW TROUT, /SALMO GAIRDNERI/. Comp. Biochem. Physicl. A Comp. Physiol. 52 (2): 359-365. Oct. 1975. SFA 22(1)
[Zool. Inst., Fac. Sci., Univ. Tokyo, Bunkyo-ku, Tokyo, Japan] Solutions of different amino acids elicited electrical olfactory responses with different spectral patterns (temporal changes of their frequency spectra) when recorded from the olfactory nerve or brain of rainbow trout. The responses of the olfactory centers had entirely different frequency structures from those of the olfactory nerve. An ability for olfactory discrimination between amino acids was suggested from the frequency spectral patterning of the responses in rainbow trout.

77-000167 Shapiro, S. A.; Hoffman, D. L. EFFECTS OF PHOTOPERIODICITY ON SERUM GLUCOSE LEVELS IN GOLDFISH (/CARASSIUS AURATUS/). Comp. Biochem. Physiol. A Comp. Physiol. 52 (1): 253-254. Sept. 1975. SFA 22(1)
[Dep. Biol., Bucknell Univ., Lewisburg, PA 17837] Blood samples were collected from goldfish maintained on photoperiod schedules of either continuous light, 12-12 hr light-dark, or 12-12 hr reversed light-dark. Serum glucose levels were determined using commercially available Glucostat enzyme assay kits. The distribution of serum glucose levels among goldfish maintained on continuous light was bimodal indicating possible asynchronous cycling. The serum glucose levels of goldfish maintained on 12-12 hr dark was significantly higher during the dark period than during the light period.

77-000168 Sharp, G. D. A COMPARISON OF THE C(2) DISSOCIATION PROPERTIES OF SOME SCOMERID HEMOGLOBINS. Comp. Biochem. Physiol. A Comp. Physiol. 51 (3): 683-691. July 1975. SFA 22(1)
[Scripps Inst. Oceanogr., La Jolla, CA 92037]

77-000169 Singley, J. A.; Chavin, W. THE ADRENOCORTICAL-HYPOPHYSEAL RESPONSE TO SALINE STRESS IN THE GOLDFISH, /CARASSIUS AURATUS/ L. Comp. Biochem. Physiol. A Comp. Physiol. 51 (4): 749-756. Aug. 1975. SFA 22(1)
[Dep. Biol., Wayne State Univ., Detroit, MI 48202]

77-000170 Singley, J. A.; Chavin, W. THE DIEL RHYTHM OF CIRCULATING ACTH TITER IN THE GOLDFISH (/CARASSIUS AURATUS L./). Comp. Biochem. Physiol. A Comp. Physiol. 53 (3): 291-293. 1976. SFA 22(1)
[Dep. Biol., Wayne State Univ., Detroit, MI 48202]

77-000171 Sivak, J. G.; Woo, G. C. S. ACCOMMODATIVE LENS MOVEMENT IN HOLOSTEANS (/AMIA CALVA/ AND /LEPISOSTEUS OSSEUS OXYURUS/) AND IN THE SEA LAMPREY (/PETROMYZON MARINUS/). Can. J. Zool. 53 (5): 516-520. May 1975. In English with French summ. SFA 22(1)
[Sch. Optom., Univ. Waterloo, Waterloo, ON, Canada]

77-000172 Smith, J. C. BODY WEIGHT AND THE ACTIVITIES OF PYRUVATE KINASE, GLUCOSE-6-PHOSPHATASE AND LACTATE DEHYDROGENASE IN THE LIVER OF THE AMERICAN PLAICE, /HIPPOGLOSSOIDES PLATESSOIDES/. SFA 22(1) 53 (3): 277-282. 1976. SFA 22(1)
[Dep. Environ., Fish. Mar Serv., Mar. Ecol. Lab., Bedford Inst. Oceanogr., Dartmouth, NS, Canada] The hypothesis that the activities of hepatic regulatory enzymes might be related to body wt (W) in the same manner as metabolic rate is tested in the American plaice. Lactate dehydrogenase activity is low and unrelated to W, possibly due to discontinuity of peripheral lactate supply. All measures of hepatic pyruvate kinase (PyK) and glucose-6-phospatase activities are significantly correlated with W, but only total PyK and total PyK per unit W are related to W to the 0.8 and W to the -0.2 as hypothesized. These findings may be related to seasonal variations in the importance of these enzymes in benthic fish.

77-000173 Smith, J. R.; Weber, L. J. THE REGULATION OF DAY-NIGHT CHANGES IN HYDROXYINDOLE-O-METHYLTRANSFERASE ACTIVITY IN THE PINEAL GLAND OF STEELHEAD TROUT (/SALMO GAIRDNERI/). Can. J. Zool. 54 (9): 1530-1534. Sept. 1976. In English with French Summ. SFA 22(1)
[Sch. Phar., Dep. Pharmacol. Toxicol., Oreg. State Univ., Corvallis, 97331] Elevation in pineal hydroxyindole-O-methyltransferase (HIOMT; EC 2.1.1.4) activity in juvenile steelhead trout was associated with the dark portions of three different photoperiods with a sharp increase in pineal HIOMT activity occurring in the first 4 h of darkness. This pattern of activity could be abolished by bilateral enucleation but not by surgical capping of the pineal region. Surgical exposure of the pineal region in blinded fish did not restore HIOMT responses to changes in lighting.

77-000174 Soivio, A.; Oikari, A. HAEMATOLOGICAL EFFECTS OF STRESS ON A TELEOST, /ESOX LUCIUS/ L. J. Fish. Biol. 8 (5): 397-411. May 1976. SFA 22(1)
[Dep. Zool., Univ. Helsinki, Arkadiankatu 7, SF-00100 Helsinki 10, Finland] Stress produces a haemoconcentration, elevated blood lactate, increased glucose concentrations and alters the plasma electrolyte balance in two groups (brackish- and freshwater) of the northern pike, /Esox lucius/ L., after one month's starvation. The blood glucose level of the freshwater pike was twice that of the brackish-water group, and the plasma sodium and magnesium concnetrations in the brackish-water pike were significantly higher. The haematocrit, haemoglobin and blood lactic acid concentrations were higher in freshwater pike. The plasma potassium and calcium concentrations in the two groups did not differ.--From abstr.

77-000175 Spaargaren, D. H. A COMPARATIVE STUDY ON THE REGULATION OF OSMOTIC, IONIC AND ORGANIC-SOLUTE CONCENTRATIONS IN THE BLOOD OF AQUATIC ORGANISMS. Comp. Biochem. Physiol. A Comp. Physiol. 53 (1): 31-40. 1976. SFA 22(1)

[Netherlands Inst. Sea Res., Texel, The Netherlands] For various species, mainly crustaceans and teleosts, data on the regulation of osmotic, total-ion and organic solute (non-electrolyte) concentrations in the blood have been fitted into the formula of a third-power polynomial function. A number of characterstics, which can be derived from the third-power function, have been defined for a regulation pattern: e.g. "iso"-point, "regulation extent", "regulation capacity" and "regulation limit". When a number of aquatic organisms are being compared it appears a close interspecific relationship of the regulation patterns exists. The results suggest a rough outline of the evolutionary development of the regulation patterns for the different solutes.

77-000176 Spigarelli, S. A.; Thommes, M. M.; Beitinger, T. L. THE INFLUENCE OF BODY WEIGHT ON HEATING AND COOLING OF SELECTED LAKE MICHIGAN FISHES. Comp. Biochem. Physiol. A Comp. Physiol. 56 (1): 51-57. 1977. SFA 22(1)

[Radiol. Environ. Res. Div., Argonne Natl. Lab., Argonne, IL 60439] Kinetics of change in body temperature are given for eight species of Lake Michigan fish exposed to instantaneous change in water temperature. Seven independent variables were tested by least squares to develop models to predict heating and cooling half-times and rate coefficients. Fish body wt was the best predictor of temperature change and explained up to 96 percent of the variability between individuals. Cooling half-times were significantly longer than heating half-times for live fish; no differences were found between heating and cooling of dead fish. Significantly longer half-times for dead fish and a direct relationship between the ratio of heating-cooling times and body wt demonstrated the relative importance of circulatory heat exchange.

77-000177 Staples, D. J.; Nomura, M. INFLUENCE OF BODY SIZE AND FOOD RATION ON THE ENERGY BUDGET OF RAINBOW TROUT /SALMO GAIRDNERI/ RICHARDSON. J. Fish. Biol. 9 (1): 29-43. July 1976. SFA 22(1)

[C.S.I.R.O., Div. Fish. Oceanogr., P.O. Box 120, Cleveland, Queensland 4163, Australia] Three size classes (3 g, 200 g, 1.3 kg) of rainbow trout, /Salmo gairdneri/ Richardson, were each fed five rations ranging from zero to a 'maximum' ration and the relationships among body size, food ration, metabolism and growth examined. Water temperature was constant at 11.4° C. The gross growth efficiency in wet weight, /K/, increased asymptotically with increasing ration but decreased with increasing body size. Changes in fat and moisture content of the body, however, were such that /K/ in terms of energy utilization was independent of body size when the fish were feeding at the same level. This result was not apparent when wet weight values only were considered and use of a constant to convert wet weight of fish to calorific values can lead to errors in interpretation of results. Assimilation efficiency averaged 71.7 percent over all feeding groups and was independent of body size and food ration. Total metabolic expenditure, however, increased with increasing body size and feeding level, but at any given feeding level a similar proportion of the engery of the assimilated ration was used for metabolism. At a single feeding level, therefore, the percentage utilization of energy in each category of the energy budget remained similar over all body sizes. Such a result can only be expected under laboratory conditions but it provides a base-line for comparison with the performance of other more complicated systems.

77-000178 Tay, K. L.; Garside, E. T. SOME EMBRYOGENIC RESPONSES OF MUMMICHOG, /FUNDULUS HETEROCLITUS/ (L.) (CYPRINODONTIDAE), TO CONTINUOUS INCUBATION IN VARIOUS COMBINATIONS OF TEMPERATURE AND SALINITY. Can. J. Zool. 53 (7): 920-933. July 1975. In English with French summ. SFA 22(1)

[Dep. Biol., Dalhousie Univ., Halifax, NS, Canada] Embryos of mummichog, /Fundulus heteroclitus/ (L.), were incubated in various combinations of constant salinity (0, 10, 30, 60°/oo S) and temperature (15, 20, 25, 30C) from fertilization to completion of hatching. In all instances, the velocity of embryonal development was accelerated at higher temperatures. In salinities of 0, 10, 20, 30°/oo, higher temperature had a similar accelerating effect on development rate throughout the embryonal term. However, the highest salinity (60°/oo) retarded embryonal development particularly after neurulation. This retarding effect increased with the increasing temperature. The onset of hatching and 50 percent hatching time were also retarded in 60°/oo S. Embryos hatched with difficulty in the lowest incubation combination, 0°/oo S, 15C. This observation is discussed in the light of pertinent literature. Highest percentage total hatch and viable (normal) hatch were obtained at 20C in all test salinities. Response surface analysis showed that optimum conditions for survival for mummichog embryos appeared to be associated with salinities and temperature of 19-20°/oo and 18C. Larval length was greatest in groups incubated at 15 and 20C and 0-30°/oo S.

77-000179 Terpin, K. M.; Spotila, J. R.; Koons, R. B. EFFECT OF PHOTOPERIOD ON THE TEMPERATURE TOLERANCE OF THE BLACKNOSE DACE, /RHINICHTHYS ATRATULUS/. Comp. Biochem. Physiol. A Comp. Physiol. 53 (3): 241-244. 1976. SFA 22(1)

[Dep. Biol., State Univ. Coll. Buffalo, 1300 Elmwood Ave., Buffalo, NY 14222] Blacknose dace, /Rhinichthys atratulus/, were acclimated to long daylength, 16 hr of light and 8 hr of darkness (L:D 16:8), and short daylength, 8 hr of light and 16 hr of darkness (L:D 8:16), at 20°C. Long daylength fish had a higher incipient upper lethal temperature (29.9°C) than short daylength fish (28.8°C). Long daylength fish had a significantly higher ($F \leq 0.01$) mean resistance time at all but one lethal test temperature. Lethal temperature of /R. atratulus/ is compared to that of ecologically related species.

77-000180 Trust, T. J. FACULTATIVE ANAEROBIC BACTERIA IN THE DIGESTIVE TRACT OF CHUM SALMON (/ONCORHYNCHUS KETA/) MAINTAINED IN FRESH WATER UNDER DEFINED CULTURE CONDITIONS. Appl. Microbiol. 29 (5): 663-668. May 1975. SFA 22(1)

[Dep. Bacteriol. Biochem., Univ. Victoria, Victoria, BC, Canada] The bacterial flora in the digestive tract of chum salmon growing in fresh water under defined and controlled culture conditions was examined both qualitatively and quantitatively. The predominant speices present in the digestive tract were identified as /Aeromonas/, with /Aeromonas hydrophila/ being the most common isolate. These aeromonads were not isolated from the diet. Other bacterial species commonly isolated included /Bacillus/, /Enterobacter/, nonpigmented pseudomonads, /Micrococcus/, and /Acinetobacter/. These species were also isolated from the diet or tank water. As many as 10^8 viable bacteria per g (wet weight) of digestive tract plus contents were counted. After 75 days of starvation, 10^6 viable bacteria were counted, whereas fish fed a sterile feed contained 10^5 viable bacteria per g (wet weight) of digestive tract plus contents.

77-000181 Tsukuda, H. TEMPERATURE DEPENDENCY OF THE RELATIVE ACTIVITIES OF LIVER LACTATE DEHYDROGENASE ISCZYMES IN GCLDFISH ACCLIMATED TO DIFFERENT TEMPERATURES. Comp. Bicchem. Physiol. B Comp. Biochem. 52 (3): 343-345. Nov. 1975. SFA 22(1)

[Dep. Biol., Fac. Sci., Osaka City Univ., Osaka, Japan] Liver LDH isozyme activities of goldfish acclimated to 18° and 28° were assayed at 18°, 28°, and 38°C. The relative activities of anodic isczymes, LDH's 1, 2, and 3, increase with the assay temperature while those of cathodic isozymes, LDH's 4 and 5, behave conversely. In comparison to goldfish acclimated to 28°C, those acclimated to 18°C show higher percentages of the cathodic isczymes which increase in relative activity with falling temperature. This fact is considered to be of adaptational significance.

77-000182 Vaccaro, A. M.; Raschetti, R.; Ricciardi, G.; Mcrpurgo, G. TEMPERATURE ADAPTATION AT THE HEMOGLOBIN LEVEL IN /CARASSIUS AURATUS/. Comp. Biochem. Physiol. A Comp. Physiol. 52 (4): 627-634. Dec. 1975. SFA 22(1)

[Inst. Superiore di Sanita, Viale Regina Elena, 299 Roma, Italy] Goldfish (/Carassius auratus/) were acclimatized at 4, 21 and 37°C for a minimum of 1 month to study the respiratory adaptation at the level of the hemoglobin. Goldfish present a single molecular form of Hb which does not change during the adaptation. The acclimatization produces wide fluctuations in the oxygen dissociation curves of Hb determined on the crude hemolysates. The fluctuations are determined by the presence of a cofactor different from the organic phosphates. The affinity for the oxygen of the purified Hb remains unchanged during the acclimatization. The cofactor regulates the size of the Bohr effect and diminishes the temperature dependence of the oxygenation reaction. The effect of the cofactor is largely species aspecific.

77-000183 van den Thillart, G.; Kesbeke, F.; van Waarde, A. INFLUENCE OF ANOXIA ON THE ENERGY METABOLISM CF GOLDFISH /CARASSIUS AURATUS/ (L.). Comp. Biochem. Physiol. A Comp. Physiol. 55 (4): 329-336. 1976. SFA 22(1)

[Dep. Anim. Physiol., State Univ. Leiden, Kaiserstraat 63, Leiden, The Netherlands] Goldfish has a large anoxia tolerance. At 20°C 10 hr of complete anoxia can be survived without any problem. The concentration of some metabolites were determined in dependence of anoxia, both in whole fish and dorsal white muscle. Lactate production does not cover the energy need. Apart from an increase in lactate level we were able to demonstrate an increase in concentration of alanine, creatine, total CO(2) and ADP. Concentrations of ATP and creatine-phosphate decrease with anoxia while AMP, glutamate and volatile fatty acids did not change significantly. The "energy charge" in the white muscle falls during hypoxia from 1.0 till 0.8 and stabilizes at that level during about 10 hr although the direct energy reserves of ATP and creatine-phosphate decrease.

77-000184 Vivekanandan, E. EFFECTS OF FEEDING ON THE SWIMMING ACTIVITY AND GROWTH OF /OPHIOCEPHALUS STRIATUS/. J. Fish. Biol. 8 (4)d 321-330. Apr. 1976. SFA 22(1)

[Zool. Dep., Madurai Univ. P.G. Cent., Sri Palaniandavar Arts Coll., Palni, Tamil Nadu, India] Swimming activity of the obligatory air-breathing fish /Ophiocephalus striatus/ reared in cylindrical aquaria on different rations (0-43.3 mg/g/day) increased from 58 m/day for the starving group to 439 m/day for the group fed a maximum ration. Swimming speed also increased from 2.4 cm/sec in the former group to 5.2 cm/sec in the latter group. Owing to sustained swimming activity

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and the consequent fatigue, the test individuals 'hung' to the surface for a definite interval. Duration of surface 'hanging' increased from 3.2 h/day to 15.8 h/day with decreasing ration. The group receiving 25.5 mg/g/day converted most efficiently (28 percent). The maintenance energy cost is equivalent to 10 mg/g/day and dry substance equivalent to 5 or 12 mg/g/day was expended on the sustained swimming activity by the fish receiving the optimum (25 mg/g/day) or the maximum (43 mg/g/day) ration.

77-000185 Walker, R. L.; Fromm, P. O. METABOLISM OF IRON BY NORMAL AND IRON DEFICIENT RAINBOW TROUT. Comp. Biochem. Physiol. A Comp. Physiol. 55 (4): 311-318. 1976. SFA 22(1)
[Dep. Biol., Univ. Calgary, Calgary, AB T2N 1N4, Canada] Iron metabolism in normal and iron deficient rainbow trout was studied after intraperitoneal injection of ^{59}Fe. In both groups most of the ^{59}Fe was absorbed from the peritoneal cavity within 24 hr and equilibrium between the plasma ^{59}Fe pool and that of the tissues was attained 8 days after i.p. injection. Liver iron, the main storage pool in trout, was reduced from the control level of 185 ug/g to less than 100 ug/g 16 days after bleeding, whereas, splenic iron stores were unaffected. In iron deficient fish the RBC ^{59}Fe content increased to 70-80 percent of the injected dose by day 16 compared to 50 percent in controls. This was attributed to the difference in reticulocyte count which was 10-20 percent for the bled fish and 2-3 percent in controls. Some iron accumulated by erythrocytes is temporarily stored as non-heme iron by these cells. An average of 15 percent of the i.p. injected ^{59}Fe was taken up by hepatic tissue of control fish and remained there throughout the 30 day study. In iron deficient trout liver radioiron was reduced from a high of 15 percent on day 2 to less than 1 percent of the initial dose by day 16 post bleeding. There was essentially no detectable loss of ^{59}Fe in the urine or feces of either normal control or iron deficient fish.

77-000186 Webb, J. T.; Brown, G. W., Jr. SOME PROPERTIES AND OCCURRENCE OF GLUTAMINE SYNTHETASE IN FISH. Comp. Biochem. Physiol. B Comp. Biochem. 54 (1): 171-175. 1976. SFA 22(1)
[Coll. Fish., Univ. Wash., Seattle 98915] Transferase activity of glutamine synthetase, /K(m)/ for glutamine, and pH optimum were determined in brain and liver tissues of several species of fish. Specific activity was high in elasmobranch liver and below limits of detection in teleost liver. Chinook salmon (/Oncorhynchus tshawytscha/) glutamine synthetase was inhibited by higher than optimal concentrations of hydroxylamine, a substrate which also affected the /K(m)/ value for glutamine. The enzyme from Chinook salmon brain is inhibited by (in decreasing order): Zn^{2+}, Cd^{2+}, Mn^{2+}, and Mg^{2+}. The assay method, activities, and inhibition are discussed relative to environment, physiology, and phylogeny of the species studied.

77-000187 Weber, R. E.; de Wilde, J. A. M. MULTIPLE HAEMOGLOBINS IN PLAICE AND FLOUNDER AND THEIR FUNCTIONAL PROPERTIES. Comp. Biochem. Physiol. B Comp. Biochem. 54 (3): 433-437. 1976. SFA 22(1)
[Zoophysiol. Lab., Univ. Aarhus, Denmark] Iso-electric focusing experiments reveal a marked heterogeneity of plaice and flounder haemoglobins. The component haemoglobins are isolated for functional study. The isolated plaice haemoglobins are very similar with regard to oxygen affinity, Bohr effects and ATP and temperature sensitivities. The main flounder haemoglobins have higher oxygen affinities and smaller Bohr factors. The oxygenation properties lack evidence for interaction between the component haemoglobins. The

77-000187 CONTINUED
component differentiations are discussed comparatively in relation to the inactivity of flatfish and the hypoxic conditions that may prevail in their benthic habitats.--From abstr.

77-000188 Weber, R. E.; Lykkeboe, G.; Johansen, K. PHYSIOLOGICAL PROPERTIES OF EEL HAEMOGLOBIN: HYPOXIC ACCLIMATION, PHOSPHATE EFFECTS AND MULTIPLICITY. J. Exp. Biol. 64 (1): 75-88. Feb. 1976. SFA 22(1)
[Dep. Zoophysiol., Univ. Aarhus, Denmark] Unlike the whole blood oxygen affinity, which adapts readily to environmental oxygen tensions, haemoglobins prepared from normoxic- and hypoxic-acclimated eels (/Anguilla anguilla/) show no adaptive changes in oxygenation properties or in multiplicity. Hypoxic acclimation is, however, accompanied by a strong decrease in red cell nucleoside triphosphates, particularly guanosine triphosphate (GTP), which depresses oxygen affinity of the composite and component haemoglobins more strongly than does the concurring ATP. The effects of pH, temperature and salts on the oxygenation properties of the (isolated) haemoglobins are reported, discussed in relation to the varying environmental conditions encountered by eels, and compared with data on American and Japanese eels (/A. rostrata/ and /A. japonica/, respectively).

77-000189 Wills, R. B. H.; Hopkirk, G. DISTRIBUTION AND FATTY ACID COMPOSITION OF LIPIDS OF EELS (/ANGUILLA AUSTRALIS/). Comp. Biochem. Physiol. B Comp. Biochem. 53 (4): 525-527. 1976. SFA 22(1)
[Dep. Food Technol., Univ. N.S.W., Kensington, N.S.W., Australia]

77-000190 Windell, J. T.; Kitchell, J. F.; Norris, D. O.; Norris, J. S.; Foltz, J. W. TEMPERATURE AND RATE OF GASTRIC EVACUATION BY RAINBOW TROUT, /SALMO GAIRDNERI/. Trans. Am. Fish. Soc. 105 (6): 712-717. Nov. 1976. SFA 22(1)
[Dep. Environ. Population Organismic Biol., Univ. Colo., Boulder 80309] Young-of-the-year hatchery reared rainbow trout, /Salmo gairdneri/, were used to estimate the rate of gastric evacuation of meals of oligochaetes and commercial pellets at water temperatures of 5, 10, 15, and 20 C. Different regression models produced different predictions for 25, 50, and 100 percent stomach emptying times for pellet meals consumed at 15 C. Greatest variation occurred when predicting time required for 100 percent stomach evacuation. Estimates ranged from 22 to 35 h for a substantial 13-h difference. Because the semilog model consistantly produced the highest /F/ regression and the lowest /F/ deviation it was selected as best for describing the data. Rate of gastric evacuation increased with increasel temperature. Differences were greatest between 0 and 5 C and least between 15 and 20 C. An increase of 5 C at the low end of the temperature range produced a much greater absolute effect than at the high range. Depending on food type, it took 3 to 4 times as long to empty the stomach by 50 percent or 100 percent at 5 C as it did at 20 C. Time to empty the stomach increased from a minimum of 16.4 h at 20 C for both foods to 58.5 h and 72.4 h at 5 C for oligochaetes and pellets, respectively.

77-000191 Wirtz, P.; Davenport, J. INCREASED OXYGEN CONSUMPTION IN BLENNIES (/BLENNIUS PHOLIS/ L.) EXPOSED TO THEIR MIRROR IMAGES. J. Fish. Biol. 9 (1): 67-74. July 1976. SFA 22(1)
[Max-Planck Inst. Verhaltensphysiol., D 8131 Seewiesen, Abteilung Wickler, West Bermany] The sight of its mirrored image increases the oxygen consumption of /Blennius pholis/. This is due to an increased metabolic rate and an increased activity. For schooling species, the opposite effect has been reported in the literature and has been termed the 'group effect'. The /B. pholis/ response is discussed in relation to species specific preferences of the social environment. The hypothesis is put forward that deviations from the preferred social environment cause an activation of the individual.

77-000192 Woosley, J. T.; Linton, J. R. ISOLATION AND CHARACTERIZATION OF PROLACTIN FROM THE GREY MULLET, /MUGIL CEPHALUS/. Comp. Biochem. Physiol. B Comp. Biochem. 53 (1): 133-137. 1976. SFA 22(1)
[Dep. Biol., Univ. South Fla., Tampa 33620]

77-000193 Wootton, R. J.; Evans, G. W. COST OF EGG PRODUCTION IN THE THREE-SPINED STICKLEBACK (/GASTEROSTEUS ACULEATUS/ L.). J. Fish. Biol. 8 (5): 385-395. May 1976. SFA 22(1)
[Dep. Zool., Univ. Coll. Wales, Aberystwyth, Dyfed, United Kingdom] In the interval between successive spawnings, female sticklebacks consumed approximately their own wet weight of /Tubifex/. On average, for 100 cal of food consumed, 26 cal of eggs, 3 cal of somatic growth and 11 cal of faeces were produced. In the absence of somatic growth, the efficiency of egg production was estimated as nearly 30 percent and it was predicted that in the absence of egg production, the efficiency of somatic growth would range from 20 percent for a fish of 0.8 g wet weight to 3 percent for 2 g fish. The weight of eggs produced at a spawning was a function of the weight of the female but not of the amount of food consumed. If food consumption was not sufficient to cover the cost of egg production, the fish lost weight. Total production (the summation of egg production and somatic growth) was a function of the amount of food consumed.

77-000194 Youson, J. H. ABSORPTION AND TRANSPORT OF EXOGENOUS PROTEIN IN THE ARCHINEPHRIC DUCT OF THE OPISTHONEPHRIC KIDNEY OF THE SEA LAMPREY, /PETROMYZON MARINUS/ L. Comp. Biochem. Physiol. A Comp. Physiol. 52 (4): 639-643. Dec. 1975. SFA 22(1)
[Dep. Zool., Scarborough Coll., Univ. Toronto, West Hill, ON, Canada]

77-000195 Zaugg, W. S.; McLain, L. R. INFLUENCE OF WATER TEMPERATURE ON GILL SODIUM, POTASSIUM-STIMULATED ATPASE ACTIVITY IN JUVENILE COHO SALMON (/ONCORHYNCHUS KISUTCH/). Comp. Biochem. Physiol. A Comp. Physiol. 54 (4): 419-421. 1976. SFA 22(1)
[U.S. FWS, West. Fish. Nutr. Lab., Cook, WA 98605] Gill sodium, potassium-stimulated ATPase activity was determined from December to July in gills of yearling coho salmon (/Oncorhynchus kisutch/) maintained at four temperatures, 6, 10, 15 and 20°C. Compared to fish held at 6°C, elevation in ATPase activity and the associated parr-smolt transformation were accelerated in fish at 10 and 15°C whereas animals at 20°C experienced at best only a transitory elevation in activity. Fish transferred from one temperature to another developed ATPase activities characteristic of fish residing at temperatures to which they were transferred. Cold water (6°C) tended to preserve the elevated ATPase activity while higher temperatures (10 and 15°C)

77-000195 CONTINUED
caused decreases after an initial accelerated increase.

GENETICS, VARIATION STUDIES AND HYBRIDIZATION

77-000196 Arcement, R. J.; Rachlin, J. W. A STUDY OF THE KARYOTYPE OF A POPULATION OF BANDED KILLIFISH (/FUNDULUS DIAPHANUS/) FROM THE HUDSON RIVER. J. Fish. Biol. 8 (2): 119-125. Feb. 1976. SFA 22(1)
[Dep. Biol. Sci., Hubert H. Lehman Coll., Bedford Park Blvd., West, Bronx, NY 10468] Studies were carried out to find appropriate techniques for securing a suitable karyotype from a population of /Fundulus diaphanus/ in the Hudson River and to compare it with a published karyotype of a population of the same species from the New Haven, Connecticut area. A modification of the basic method of Denton & Howell proved to be a simple, effective and inexpensive approach for acquiring numerous and distinct chromosomal spreads for detailed karyotype analyses. The two karyotypes were identical in modal number, arm number and number of submetacentrics; however, they differed in numbers of acrocentrics and secondary constrictions. These differences may indicate incipient chromosomal evolution with the two distinct environments acting as selective agents. Preliminary work was carried out with banding techniques; the modified Denton & Howell method with banding appears to be an effective and promising direction for fish cytogenetics.

77-000197 Avise, J. C.; Smith, J. J.; Ayala, F. J. ADAPTIVE DIFFERENTIATION WITH LITTLE GENIC CHANGE BETWEEN TWO NATIVE CALIFORNIA MINNOWS. Evolution 29 (3): 411-426. Sept. 1975. SFA 22(1)
[Dep. Genet., Univ. Calif., Davis 95616] We have studied allelic variation at 24 loci coding for soluble proteins in two presumed species of California minnows--/Hesperoleucus symmetricus/ and /Lavinia exilicauda/. Our estimates indicate that they differ at one electrophoretically detectable codon substitution for every 20 loci. This small amount of genetic divergence is unusual in interspecies comparisons. Nonetheless, there is evidence that /Hesperoleucus/ and /Lavinia/ are different species. They are considerably different in morphological and ecological attributes, and exhibit strong prezygotic isolating barriers. Their distinctness is largely retained also where they are sympatric. The close genic similarity between /Hesperoleucus/ and /Lavinia/ is due in part to their recent separation from a common ancestor, perhaps during the middle or late Pleistocene. In any case, significant adaptative differentiation leading to speciation has occurred within the context of relatively few genic changes.--Summ.

77-000198 Child, A. R.; Burnell, A. M.; Wilkins, N. P. THE EXISTENCE OF TWO RACES OF ATLANTIC SALMON (/SALMO SALAR/ L.) IN THE BRITISH ISLES. J. Fish. Biol. 8 (1): 35-43. Jan. 1976. SFA 22(1)
[Minist. Agric. Fish. Food, Salmon Freshwater Fish. Lab., Weymouth, Dorset, England] Sera from approximately 10,000 Atlantic salmon collected from rivers in the British Isles have been analysed. Polymorphism at the trasferrin locus was observed and the distribution of the transferrin alleles provides further evidence supporting the presence of two races of salmon.--From abstr.

77-000199 Colgan, P. W.; Ballantyne, P. K.; Wilson, M. V. H. NUMERICAL TAXONOMY OF HYBRIDIZING /LEPOMIS/ (CENTRARCHIDAE) IN LAKE OPINICON, ONTARIO. Can. J. Zool. 54 (1): 42-47. Jan. 1976. In English with French summ. SFA 22(1)

[Dep. Biol., Queen's Univ., Kingston, ON K7L 3N6, Canada] Cluster analysis of hybridizing /Lepomis gibbosus/ (pumpkinseeds) and /L. macrochirus/ (bluegills) collected in Lake Opinicon, Ontario, using data on 20 morphological characters in 108 specimens, revealed three groups, the two parental species and a group of hybrids, all of which were clearly separated by discriminant analysis. Discriminant functions based on the red opercular flap, the pharyngeal dentition, and body depth, correctly assigned all specimens to the appropriate group. Discriminant functions are also reported for external characters only, but the assignment to groups is not perfect. A sample of /L. gibbosus/, taken from a locality in which other /Lepomis/ species were not present, was found to be very similar to the Lake Opinicon sample of this species. The hybrids of Lake Opinicon do not appear to backcross frequently with the parental species, possibly because of nonintermediacy in reproductive behavior.

77-000200 Kaydanova, T. I. A STUDY OF THE KARYOTYPES OF THE BROWN TROUT, /SALMO TRUTTA/ MORPHA /FARIO/, OF THE ROPSHA POPULATION. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 1007-1012. 1975. SFA 22(1)

[GosNIORKh, Leningrad, USSR] A karyological analysis of the Ropsha population of brown trout showed that the diploid chromosome number in fish of this population was 78 with a total number of chromosomal arms of 98. Comparing our data with published data, it is possible to assume the existence of intraspecific and interpopulation differences in the number of chromosomes in /S. trutta/.--Concl.

77-000201 Kornfield, I. L.; Koehn, R. K. GENETIC VARIATION AND SPECIATION IN NEW WORLD CICHLIDS. Evolution 29 (3): 427-437. Sept. 1975. SFA 22(1)

[R. K. Koehn: Program Ecol. Evol., State Univ. N. Y., Stony Brook 11790]

77-000202 McKenzie, J. A.; Martin, C. TRANSFERRIN POLYMORPHISM IN BLUEBACK HERRING, /ALOSA AESTIVALIS/ (MITCHILL). Can. J. Zool. 53 (11): 1479-1482. Nov. 1975. In English with French summ. SFA 22(1)

[Dep. Biol., Univ. New Brunswick, Fredericton, NB E3B 5A3, Canada] Using vertical polyacrylamide electrophoresis and autoradiography we have shown that blueback herring, (/Alosa aestivalis/), is polymorphic for transferrins found in the plasma. Assuming a three-allele, one-locus system, the frequencies of the transferrin bands agree with the Hardy-Weinberg model. Of the four samples analysed, two were similar in transferrin frequencies but these were different from the other two. We conclude that transferrin is of limited suitability as a population marker in the case of blueback herring resident in the St. John River, New Brunswick.

77-000203 Savvaitova, K. A. THE POPULATION STRUCTURE OF /SALMO MYKISS/ IN KAMCHATKA. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 876-888. 1975. SFA 22(1)
[Dep. Ichthyol., Moscow Univ., Moscow, USSR] The species /Salmo mykiss/ is represented by diadromous and freshwater forms. The populations of the different rivers are ecologically heterogeneous and consist of intrapopulation groupings. In the northern populations typically anadromous groupings predominate while in the southern populations the proportion of freshwater groupings increases. The increase in the proportion of the latter in the population is observed on the boundary of the range of the diadromous form. The differences in the meristic characters between all the groupings throughout the range are slight. The differences between the populations in the different parts of the range are the result of ecological differences. Between the peripheral populations of the diadromous and freshwater forms there are transitions of a morphological and ecological characteristics and consequently there is no reason to question their taxonomic identity. At present the species /S. mykiss/ exists as a relatively stable system of populations with a complex intrapopulation ecological structure.

77-000204 Suvorova, T. F. A DESCRIPTION OF THE MORPHOLOGICAL CHARACTERS OF THE BREAM, /ABRAMIS BRAMA/, AND WHITE BREAM, /BLICCA BJOERKNA/, OF SVIYAGA BAY, KUYBYSHEV RESERVOIR, IN CONNECTION WITH THE BIOLOGICAL HETEROGENEITY OF LOCAL POPULATIONS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 1002-1007. 1975. SFA 22(1)
[Kazan Univ., USSR]

77-000205 Vasil'yev, V. P. KARYOTYPES OF DIFFERENT FORMS OF THE KAMCHATKA TROUT, /SALMO MYKISS/ AND THE RAINBOW TROUT, /SALMO GAIRDNERI/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 889-900. 1975. SFA 22(1)
[Dep. Ichthyol., Moscow Univ., Moscow, USSR] Karyotypes of the diadromous and freshwater trout, /Salmo mykiss/ were obtained for the first time. The karyotype of the diadromous trout: 2n = 60-62, NF = 108; of the freshwater trout: 2n = 58-60, NF = 104. The karyotype of the rainbow trout /Salmo gairdneri/ includes 62 chromosomes and 104 chromosomal arms. On the basis of data obtained the systematic relations between the different forms of /S. mykiss/ and between /S. mykiss/ and /S. gairdneri/ are considered.

BEHAVIOR

77-000206 Bozhkov, A. T. AN INSTANCE OF AN ATTACK BY A SWORDFISH (/XIPHIAS GLADIUS/) ON A MAKO SHARK (/ISURUS GLAUCUS/). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 842-843. 1975. SFA 22(1)
[State Oceanogr. Inst, Leningrad, USSR]

77-000207 Crawshaw, L. I. ATTAINMENT OF THE FINAL THERMAL PREFERENDUM IN BROWN BULLHEADS ACCLIMATED TO DIFFERENT TEMPERATURES. Comp. Biochem. Physiol. A Comp. Physiol. 52 (1): 171-173. Sept. 1975. SFA 22(1)
[Yale Univ. Sch. Med., New Haven, CT 06519] Brown bullheads (/Ictalurus nebulosus/) were acclimated to temperatures of 7°, 15°, 24°, and 32° C for periods of 10 to 20 days. The fish were then placed in a thermal gradient and the selected temperature recorded continuously for one to two days. Immediately after placement in the

77-000207 CONTINUED
gradient, the four acclimation temperatures produced the following selected temperatures: 16°, 21°, 26°, and 31° C. After 10 hr, the fish acclimated to 7° and 15° C were selecting 25° C water, and within one day were selecting water of 29-30° C. The final thermal preferendum of the brown bullhead is probably between 29° and 31° C.

77-000208 Crawshaw, L. I. TWENTY-FOUR HOUR RECORDS OF BODY TEMPERATURE AND ACTIVITY IN BLUEGILL SUNFISH (/LEPOMIS MACROCHIRUS/) AND BROWN BULLHEADS (/ICTALURUS NEBULOSUS/). Comp. Biochem. Physiol. A Comp. Physiol. 51 (1): 11-14. May 1975. SFA 22(1)
[Yale Sch. Med., 90 Congress Ave., New Haven, CT 06519] Dorsal muscle temperature and activity were continuously monitored from bluegill sunfish and brown bullheads placed in a thermal gradient exposed to the natural photoperiod. The bluegill showed increased activity during the day, while the bullheads were more active at night. Both species of fish maintained a relatively constant body temperature during different levels of activity and phases of the photoperiod.

77-000209 Farr, J. A. THE ROLE OF PREDATION IN THE EVOLUTION OF SOCIAL BEHAVIOR OF NATURAL POPULATIONS OF THE GUPPY, /POECILIA RETICULATA/ (PISCES: POECILIIDAE). Evolution 29 (1): 151-158. Mar. 1975. SFA 22(1)
[Dep. Biol. Sci., Unit I, Fla. State Univ., Tallahassee 32306] Natural populations of the guppy, /Poecilia reticulata/, were studied in Trinidad and Tobago, and it was discovered that male sexual behavior and degree of social cohesiveness vary drastically as a function of type of predation pressure. In populations with no predators or with various large characin and cichlid predators, the guppies live in dense aggregates along the edges of streams, and males exhibit a high rate of sexual behavior. Where the small cyprinodont /Rivulus hartii/ is the sole predator, sexual behavior is low and the guppies tend to disperse sparsely across the entire stream. It is believed that the organization into dense aggregates facilitates finding mates and offers protection from the large predators, and that sexual selection has maximized rate of courtship behavior as a result of male-male competition for females. Because of its mode of feeding and its preference for shallow water, /Rivulus/ exerts a negative selection pressure on this type of organization, so the guppies have lost the tendency to aggregate and they exhibit a low rate of sexual behavior.--Summ.

77-000210 Lewis, D. B. STUDIES OF THE BIOLOGY OF THE LESSER WEEVER FISH /TRACHINUS VIPERA/ CUVIER. I. ADAPTATIONS TO A BENTHIC HABIT. J. Fish. Biol. 8 (2): 127-138. Feb. 1976. SFA 22(1)
[Dep. Adult Educ., Univ. Hull, England] The anatomical adaptations to a benthic mode of life are reviewed and discussed. The functioning of the pectoral, pelvic and anal fins in moving sand from underneath the animal, during burrowing, are described. Jets of water directed downwards from the gill chambers, produce a fluid sand-water mixture which facilitates the functioning of the pelvic fins, and the movement of the head into the sand. The direction of water movements associated with gill ventilation, which are propelled almost exclusively by the branchiostegal rays, are outlined. Inhalation is normally through the mouth, which is protected by papillae, from being blocked by sand. When the mouth is covered with sand, the water flow through it is reduced, and some inhalation occurs through the dorsal margin of the operculum, involving use of the supracliethrum.

77-000211 Mochek, A. D.; Silva, A. THE GROUP BEHAVIOR OF FISHES OF THE GENUS /HAEMULON/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 790-793. 1975. SFA 22(1)
[IEMEZA, Moscow, USSR] Results of underwater observations on behavior in a community of fishes of the genus /Haemulon/ are presented. Great diversity of behavior both in groups and in individuals was found.

77-000212 Muller, K. ZUR CHRONOBIOLOGIE DER MARAENE (/COREGONUS LAVARETUS/ L.) AM POLARKREIS. [CHRONOBIOLOGICAL STUDIES ON WHITEFISH (/COREGONUS LAVARETUS/ L.) AT THE ARCTIC CIRCLE.] Arch. Fischereiwiss. 27 (2): 121-132. Nov. 1976. In German with English summ. SFA 22(1)
[Abisko Sci. Res. Stn., R. Swedish Acad. Sci., Abisko, Sweden] Experiments with solitarily confined whitefishes and schools of the same species were performed in both natural light-dark regimes, with their extreme subarctic summer and winter lighting conditions, as well as under artificial illumination. The locomotory activity of the fish was continuously recorded by means of a red-light-beam photocell system connected to Almeg time printers and Esterline-Angus event recorders. Both the solitary fishes and the schools were day-active throughout the year. During the subarctic summer from the end of May to the beginning of August, the solitary fish showed arhythmic locomotor activity. The school, on the other hand became desynchronized only during a shorter period (19-28 June) when the sun was continuously above the horizon. Onset and end of the activity period was always positively correlated with the value of a 5-lux threshold. The sum of activity (cummulative activity sum) for both the solitary individuals and the school was dependent upon the yearly temperature cycle. Attempts to experimentally release spontaneous periodicity were only partially successful. At 10 °C and 1 lux continuous illumination, five fishes displayed free-running activity of 24.8 to 25.6 hr for a period of 12 days after which the activity became arhythmic. At higher light intensities the fishes were always arhythmic. During artificial light-dark alternation (5,000 lux) the fishes were always light active from LD (22:2) to LD (4:20). At LD (2: 22) the fishes showed an arhythmic activity pattern. Solitary fishes showed different behaviour compared with schools when they were transfered from artificial LD (12:12) to continuous darkness (DD): Solitary fishes lost immediately the diel rhythmicity, while shools retained it for ten days and in the same phase which they had during the artificial light-dark changes.--From abstr.

77-000213 Peden, A. E. DIFFERENCES IN COPULATORY BEHAVIOR AS PARTIAL ISOLATING MECHANISMS IN THE POECILIID FISH /GAMBUSIA/. Can. J. Zool. 53 (9): 1290-1296. Sept. 1975. In English with French summ. SFA 22(1)
[British Columbia Prov. Mus., Victoria, BC, Canada]

77-000214 Peterson, C. H. CRUISING SPEED DURING MIGRATION OF THE STRIPED MULLET (/MUGIL CEPHALUS/ L.): AN EVOLUTIONARY RESPONSE TO PREDATION? Evolution 30 (2): 393-396. June 1976. SFA 22(1)
[Dep. Biol. Sci., Univ. Maryland, Catonsville 21228]

77-000215 Popper, A. N.; Clarke, N. L. THE AUDITORY SYSTEM OF THE GOLDFISH (/CARASSIUS AURATUS/): EFFECTS OF INTENSE ACOUSTIC STIMULATION. Comp. Biochem. Physiol. A Comp. Physiol. 53 (1): 11-18. 1976. SFA 22(1)

[Dep. Zool., Univ. Hawaii, Honolulu 96822] Behavioral investigations were made of the effects of intense pure tone stimulation on auditory thresholds for the goldfish (/Carassius auratus/). Results indicate that different stimulation frequencies have a different effect on the test frequencies while each of the test frequencies had the same degree of threshold shift after stimulation to each of the stimulation frequencies. Results are interpreted to indicate that the teleost inner ear responds in a relatively complex fashion to different stimulating frequencies and this may indicate some degree of spatial signal analysis in the inner ear.

77-000216 Power, M. E.; Todd, J. H. EFFECTS OF INCREASING TEMPERATURE ON SOCIAL BEHAVIOUR IN TERRITORIAL GROUPS OF PUMPKINSEED SUNFISH, /LEPOMIS GIBBOSUS/. Environ. Pollut. 10 (3): 217-223. Apr. 1976. SFA 22(1)

[Boston Univ. Mar. Program, Mar. Biol. Lab., Woods Hole, MA 02543] To study the effect of thermal stress on their social behaviour, ten territorial groups of pumpkinseed sunfish, /Lepomis gibbosus/, were subjected to a 1°C temperature increase every other day until they succumbed. Social behaviour remained remarkably unchanged by thermal stress until nearly lethal levels. As temperature rose, ritualised behaviours increased in frequency, then fell off, probably reflecting changes in general activity. Behavioural and physiological signs of stress appeared from 31 to 38°C. Events during these social breakdowns are described and compared with the response of two other freshwater fishes with different social organisations subjected to the same thermal regime.

77-000217 Smith, R. J. F. MALE FATHEAD MINNOWS (/PIMEPHALES PROMELAS/ RAFINESQUE) RETAIN THEIR FRIGHT REACTION TO ALARM SUBSTANCE DURING THE BREEDING SEASON. Can. J. Zool. 54 (12): 2230-2231. Dec. 1976. In English with French summ. SFA 22(1)

[Dep. Biol., Univ. Saskatchewan, Saskatoon, SN S7N 0W0, Canada] In laboratory and field tests, breeding male fathead minnows respond to conspecific skin extract with a fright reaction despite their own seasonal loss of alarm substance cells. Their fright reaction is facilitated by the presence of other fatheads.

77-000218 Symons, P. E. K. BEHAVIOR AND GROWTH OF JUVENILE ATLANTIC SALMON (/SALMO SALAR/) AND THREE COMPETITORS AT TWO STREAM VELOCITIES. J. Fish. Res. Board Can. 33 (12): 2766-2773. Dec. 1976. In English with French summ. SFA 22(1)

[Dep. Enviorn., Fish. Mar. Serv., Biol. Stn., St. Andrews, NB E0G 2X0, Canada] In a laboratory stream juvenile Atlantic salmon (/Salmo salar/), common shiners (/Notropis cornutus/), blacknose dace (/Rhinichthys atratulus/), and white suckers (/Catostomus commersoni/) apparently preferred habitats that simulated their natural ones. Only salmon and one sexually mature male shiner defended territories. Dace were gregarious and nomadic, shiners tended to school in open water, and suckers were asocial bottom browsers. No competitive advantage or disadvantage was apparent between species in capturing drift food and growing at fast and slow stream velocities. However, salmon, because of their aggressive territorial behavior, successfully competed for and reduced presence of other species in their preferred boulder habitat.

77-000219 Vinyard, G. L.; O'Brien, W. J. EFFECTS OF LIGHT AND TURBIDITY ON THE REACTIVE DISTANCE OF BLUEGILL (/LEPOMIS MACROCHIRUS/). J. Fish. Res. Board Can. 33 (12): 2845-2849. Dec. 1976. In English with French summ. SFA 22(1)

[Dep. Syst. Ecol., Univ. Kans., Lawrence 66045] Changes in the reactive distance of bluegill (/Lepomis macrochirus/) to various sizes of /Daphinia pulex/ were measured at light intensities ranging from 0.70 to 215.3 lx (0.065-20.0 ft-c) and at turbidities ranging from 1 to 30 Jackson Turbidity Units (JTU). Both reduced illumination and increased turbidity caused substantial reduction in the reactive distance of bluegill for all prey sizes, and particularly for large prey. This result should be considered in efforts to determine fish feeding rates in lakes, and may be particularly relevent to vertically migrating zooplankton, or those inhabiting more turbid waters.

77-000220 Weinstein, M. P.; Yerger, R. W. ELECTROPHORETIC INVESTIGATION OF SUBPOPULATIONS OF THE SPOTTED SEATROUT, /CYNOSCION NEBULOSUS/ (CUVIER), IN THE GULF OF MEXICO AND ATLANTIC COAST OF FLORIDA. Comp. Biochem. Physiol. B Comp. Biochem. 54 (1): 97-102. 1976. SFA 22(1)

[Marco Ecol. Stn., N. Barfield Dr., Marco Island, FL 33937] Blood samples and eye lenses were collected from 500 spotted seatrout, /Cynoscion nebulosus/ (Cuvier) at seven estuaries along the Gulf coast and in the Indian River area of Florida. Sera and eye lens extracts were processed by acrylamide gel electrophoresis and the banding patterns subjected to a population analysis. Each estuary was found to contain a discrete population of seatrout, differences among the populations increasing with geographic distance. Serum protein patterns provided a more sensitive method of detecting population differences than did lens proteins. Attempts were made to study the inheritance pattern of transferrins, but in every instance (194 serum samples) only a single band was present on each gel. A method is described for attaining satisfactory resolution without the time-consuming method of utilizing multiple layer gels.

LIFE HISTORIES-GENERAL WORKS

77-000221 Bhusari, B. V. BIOLOGY AND FISHERY OF /PSEUDOSCIAENA SINA/ (C.) AT RATNAGIRI, SOUTH MAHARASHTRA. J. Bombay Nat. Hist. Soc. 72 (2): 357-367. Aug. 1975. SFA 22(1)

[Taraporevala Mar. Biol. Res. Stn., Bombay 400 002, India]

77-000222 Fedorova, G. V.; Vetkasov, S. A. THE BIOLOGY AND ABUNDANCE OF THE PERCH, /PERCA FLUVIATILIS/ FROM LAKE IL'MEN'. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 906-912. 1975. SFA 22(1)

[Gos NIORKh, Leningrad, USSR] Data are given on the ecology of the perch, /Perca fluviatilis/, from Lake Il'men'. From an analysis of the main types of fishing gear (small-fish and bleak nets, Trap nets) it is shown that the mean perch catch amounts to 113,870 kg a year, or 3.7 percent of the total fish catches. The younger age groups are most often caught in bleak nets and medium-sized trap nets. The role of the perch as a biological ameliorator of the lake is defined and the optimum limits of the catch established.

77-000223 Heins, D. C.; Clemmer, G. H. THE REPRODUCTIVE BIOLOGY, AGE AND GROWTH OF THE NORTH AMERICAN CYPRINID, /NOTROPIS LONGIROSTRIS/ (HAY). J. Fish. Biol. 8 (5): 365-379. May 1976. SFA 22(1)

[Dep. Biol., Tulane Univ., New Orleans, LA 70118] /Notropis longirostris/ (Hay), the longnose shiner, in Catahoula Creek, Jourdan River drainage, Hancock County, Mississippi, was studied from May 1970 to May 1972. In 1971 reproduction occurred from late March into October, as indicated by gross examination of testes, breeding tubercles and breeding colour in males, and ovarian weights, measurements of ova, and gross examination of ovaries in females. Gross examination of ovaries in 1970 also indicated an extended reproductive season. Generally no significant differences from a 1:1 sex ratio or in the size of males and females in collections taken during the reproductive season were indicated. Males and females matured about the same size. Most females were sexually mature when 29-30 mm SL. The smallest female with mature ova was 28 mm; however, the majority of females did not have mature ova until 31-33 mm. The number of mature ova produced prior to spawning ranged from 15 to 129 for females 30.8-44 mm SL. There were significant differences in the number of mature ova with time, two peaks being indicated: the first in late March and April at the beginning of the reproductive period and the second in early July about the middle of the season. This conclusion is also supported by ovarian weight measurements and length frequency histograms. The mean diameters of mature ova ranged from 0.70-1.05 mm, averaging 0.90 mm, and were not significantly correlated with length. Most fish live about 1-1.5 years and do not live through two winters, indicating an annual turnover in the population. Maximum size was about 48 mm SL. Specific characteristics of the life history pattern of /N. longirostris/ are discussed in relation to ecological conditions of the habitat.

77-000224 Ikusemiju, K. DISTRIBUTION, REPRODUCTION AND GROWTH OF THE CATFISH, /CHRYSICHTHYS WALKERI/ (GUNTHER) IN THE LEKKI LAGOON, NIGERIA. J. Fish. Biol. 8 (6): 453-458. June 1976. SFA 22(1)

[Dep. Biol. Sci., Univ. Lagos, Lagos, Nigeria] An investigation was made on the biology of the catfish, /Chrysichthys walkeri/ (Gunther) occurring in the Lekki Lagoon. The catfish was evenly distributed over the six sampled stations of the lagoon with the sites of the shallow water stations probably serving both as breeding and nursery grounds. Fecundity estimates for this species ranged from 896 to 4168 eggs. The average number of eggs per female was 2084. Laboratory incubated eggs hatched after 3 days with the yolk sac being completely absorbed on the seventh day. The fry averaged 8.6 mm on their first day of life. The catfish attained a maximum total length of 25.7 cm within a period of 2 years. There were no significant differences in the growth pattern of this species during the dry and rainy seasons.

77-000225 Larson, G. L. SOCIAL BEHAVIOR AND FEEDING ABILITY OF TWO PHENOTYPES OF /GASTEROSTEUS ACULEATUS/ IN RELATION TO THEIR SPATIAL AND TROPHIC SEGREGATION IN A TEMPERATE LAKE. Can. J. Zool. 54 (2): 107-121. Feb. 1976. In English with French summ. SFA 22(1)

[Oak Creek Lab. Biol., Dep. Fish. Wildl., Oreg. State Univ., Corvallis 98331] Significant differences in morphology, behavior, Spatial distribution, and feeding habits were found between limnetic and benthic forms of the threespine stickleback (/Gasterosteus aculeatus/) in a small British Columbia lake. The social behavior and feeding ability of each form were studied experimentally to provide a basis for determining the mechanisms of spatial and trophic segregation observed in the lake. The hypothesis that the benthic form was solitary, aggressive, and attracted to lake-bottom cover, and the limnetic form was gregarious, nonaggressive, and attracted to lake-

77-000225 CONTINUED
surface cover was supported by the laboratory experiments. Furthermore, the hypothesis that the limnetic form could feed more successfully on zooplankton, and the benthic form on macrobenthos was supported by the experiments. The benthic form spent significantly more time in search of food in lake-bottom cover than did the limnetic form. It is suggested that the two forms of stickleback had undergone extensive adaptations to very different habitats in the lake, and therefore, their spatial and food segregation was not maintained entirely by interactions, but at least partially by inherent behavioral differences.

77-000226 Mann, R. H. K. OBSERVATIONS ON THE AGE, GROWTH, REPRODUCTION AND FOOD OF THE CHUB /SQUALIUS CEPHALUS/ (L.) IN THE RIVER STOUR, DORSET. J. Fish. Biol. 8 (3): 265-288. Mar. 1976. SFA 22(1)

[Freshwater Biol. Assoc., River Lab., East Stokes, Wareham, Dorset, England] Opercular bones from 399 chub from the River Stour, Dorset were used for age and back-calculated growth measurements. Scales were only used to aid the interpretation of difficult opercular. Annuli were laid down through the period mid-April to mid-June. Growth in length was minimal between October and March. Growth rates were similar to those published for chub in other European waters, but the Stour chub were longer-lived and attained a greater ultimate size. Female chub grew faster than the males. Spawning occurred from late May into June and elaboration of the gonads took place between September and May. Immature chub had an annual cycle of condition; the 0 group having a maximum in August and older immature fish reaching their maximum in June. Both categories had a minimum condition in early spring. The cycle of gonad development affected the condition of mature fish. The numbers of eggs in chub of lengths 359-467 mm ranged from 27,000-65,000. Some females attained sexual maturity at age V or VI, but most by age VII. The majority of males matured at age V, though some at ages III or IV. Growth rates and year-class strengths varied from year to year but independently of one another. Thirty-one per cent of chub aged II or over belonged to the 1959 year class. Young chub ate insect larvae and small crustacea, but the occurrence of fish and macrophytes was greater in the diet of older fish.

77-000227 Mann, R. H. K. OBSERVATIONS ON THE AGE, GROWTH, REPRODUCTION AND FOOD OF THE PIKE /ESOX LUCIUS/ (L.) IN TWO RIVERS IN SOUTHERN ENGLAND. J. Fish. Biol. 8 (2): 179-197. Feb. 1976. SFA 22(1)

[Freshwater Biol. Assoc., River Lab., East Stoke, Wareham, Dorset, England] Opercular bones of 261 pike from the River Stour and 117 from the River Frome were used for age and back-calculated growth determinations. The annuli were laid down during late April and early May and most growth occurred between May and September. Pike growth in the two rivers was comparable with the fastest growth in other waters, through Frome pike grew slightly faster than Stour pike. Spawning occurred from the end of March into May. Elaboration of the ovaries commenced in September and was virtually completed by February, whereas the testes reached their maximum weight in October and maintained it until spawning. Immature pike had an annual cycle of condition reaching a maximum in May and a minimum during the winter. The gonad cycle affected the condition of mature females which had their minimum condition in mid-summer. The fecundity of Stour pike is expressed by the formula: log(10) egg number = 3.56 log(10) fish length (mm) - 5.40. Approximately 75 percent of all Stour pike were sexually mature by age II and these fish were, on average, larger than immature pike of the same age. The most numerous items in the diet of pike were small cyprinids, 30-80 mm fork length, although pike over 700 mm long

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ate larger fish. Few salmonids appeared in the diet of either Frome or Stour pike. The percentage of empty stomachs was highest in Stour samples taken during the summer, shorter digestion times and longer feeding periods in this period are suggested as reasons for the apparent anomaly.

77-000228 Munro, J. L. ASPECTS OF THE BIOLOGY AND ECOLOGY OF CARIBBEAN REEF FISHES: MULLIDAE (GOAT-FISHES). J. Fish. Biol. 9 (1): 79-97. July 1976. SFA 22(1)
[Univ. Papua New Guinea, P.O. Box 4820, Univ. P.O., Papua New Guinea] The reef-dwelling goat-fishes, /Pseudupeneus maculatus/ (Bloch) 1793 and /Mulloidichthys martinicus/ (C. & V.) 1829, form a small, but valuable, component of fish-trap catches in the Caribbean Sea and adjacent regions. Investigations of these species in Jamaican waters have covered relative and absolute growth rates, spawning seasons, sizes at maturity, distribution patterns, size compositions of populations, relative abundances and mortality rates. Previous literature concerning the biology and ecology of these species is reviewed.

77-000229 Otto, C. SIZE, GROWTH, POPULATION DENSITY AND FOOD OF BROWN TROUT /SALMO TRUTTA/ L. IN TWO SECTIONS OF A SOUTH SWEDISH STREAM. J. Fish. Biol. 8 (6): 477-488. June 1976. SFA 22(1)
[Zool. Mus., Nusepl 3, N-5014 Univ. Bergen, Norway] Size, growth and population density of trout, /Salmo trutta/ populations between the upper part of a small stream and downstream section were compared. The density of 0+ trout was about equal in the two sections, while trout greater than 0+ were more numerous in the downstream section. Apart from water depth and volume, abiotic conditions were similar in the two sections. The utilization by trout of the available benthos was always greater in the downstream section. The discrepancies found in trout size and density between the sections were considered to be due to the increased spatial requirements by the larger fish. Growth rate of 0+ fish in terms of length increase per month was the same in both sections. The 0+ fish were obtained in April in the downstream section, while at this time no 0+ fish were found in the upper section. Earlier hatching due to temperature differences between the sections and larger size at hatching in the downstream section were factors of possible significance.

77-000230 Popov, P. A. THE MORPHOLOGICAL AND ECOLOGICAL CHARACTERISTICS OF THE SIBERIAN DACE, /LEUCISCUS LEUCISCUS BAICALENSIS/ FROM THE TANAMA RIVER BASIN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 901-906. 1975. SFA 22(1)
[Dep. Ichthyol. Hydrobiol., Tomsk Univ., USSR] Morphological and ecological data on the Siberian dace, /Leuciscus leuciscus baicalensis/, from the Tanama River (Gydanskiy Peninsula) are presented. Differences between males and females were established with respect to two morphological characters. Morphological and ecological differences occur between dace from the Tanama River and dace from the Ob', Yenisey and Turukhan Rivers.

77-000231 Richards, C. E.; Castagna, M. DISTRIBUTION, GROWTH, AND PREDATION OF JUVENILE WHITE MULLET (/MUGIL CUREMA/) IN OCEANSIDE WATERS OF VIRGINIA'S EASTERN SHORE. Chesapeake Sci. 17 (4): 308-309. Dec. 1976. SFA 22(1)

[Va. Inst. Mar. Sci., Gloucester Point 23062] Distribution, growth, and predation level data for juvenile white mullet (/Mugil curema/ Valenciennes) were obtained in 1965 by shallow water seine hauls during an exploratory survey of oceanside embayments of Virginia's eastern shore peninsula. Average minimum growth was 17.5 mm fork length per half-month period, June through September. Highest predation incidence, 49 percent, was observed in late September inlet collections. Literature data implies juvenile white mullet, that occur north of North Carolina, have a southern origin.--From abstr.

77-000232 Ronquillo, I. A. A REVIEW OF THE ROUNDSCAD FISHERY IN THE PHILIPPINES. Philipp. J. Fish. 11 (1-2): 86-126. 1973. SFA 22(1)

[Bur. Fish. Aquatic Resour., Intramuras, Manila 2801, Philippines] The roundscads (/Decapterus/ spp.) form the most important fishery in the Philippines today. More then 30 percent of the total fish production of about one million tons reported in 1970 was composed of the two species of roundscads: both species are caught in commercial quantities throughout the Philippine archipelago. The fishery is based on the capture of the immature forms, since adults are not available. The absence of adults may be due to the loss of phototaxic response of adults to the lights used to lure the fish into the gear (the bagnet), or the adults may have moved out of the fishing grounds. The biology of these species is reviewed and a general introduction of the geography and oceanographic background of the Philippine waters provided. A description of the oceanographic conditions of the Sulu Sea, which is one of the most important fishing grounds for roundscads, was made. Through a brief discussion of the zooplankton, egg and larval distribution of tuna and tuna-like fishes, as well as other fish species, an assumption of the probable spawning areas of roundscads was advanced. For the pelagic fish, the bagnet and purse seine fisheries were shown to be the most productive; the landing from these methods exceeded 50 percent of the total fish production is explained by the increased efficiency attained by the bagnet and purse seine, resulting from the use of brighter lights, better synthetic (kuralon) nets, larger vessels, and more efficient gear.

77-000233 Shubnikov, D. A. BIOLOGY OF THE INDIAN MACKEREL (/RASTRELLIGER KANAGURTA/). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 698-709. 1975. SFA 22(1)

[VNIRO, Moscow, USSR] A hypothetical outline of the main stages in the life cycle of the two largest populations of the Indian mackerel (/Rastrelliger kanagurta/) in the Indian Ocean is proposed on the basis of a review of published data on the Arabian Sea and the author's investigations in the Bay of Bengal.

77-000234 Usmanova, R. G. ECOLOGICAL VARIABILITY OF THE "TURKESTAN GUDGEON" (/GOBIO GOBIO LEPIDOLAEMUS/) OF THE KASHKADAR'YA BASIN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 724-729. 1975. SFA 22(1)

Sexual dimorphism is shown to exist in the Turkestan gudgeon (/Gobio gobio lepidolaemus/) and to be expressed by statistically significant differences between females and males with respect to 11 of the 22 characters compared. Age-related variability is shown to exist in the morphological characters. It is established that there is a local form of the Turkestan gudgion associated with a particular habitat. The time and duration of spawning are traced, and fecundity, condition and

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the composition of the food are investigated.

POPULATION STUDIES, PRODUCTION, ETC.

77-000235 Howe, A. B.; Coates, P. G.; Pierce, D. E. WINTER FLOUNDER ESTUARINE YEAR-CLASS ABUNDANCE, MORTALITY, AND RECRUITMENT. Trans. Am. Fish. Soc. 105 (6): 647-657. Nov. 1976. SFA 22(1)
[Div. Mar. Fish., Sandwich, MA 02563] Mark-recovery methodology, accounting for mortality, enabled annual estimates of estuarine winter flounder (/Pseudopleuronectes americanus/) abundance at summer's end. Recruitment from the estuarine system to an inshore-offshore otter trawl fishery occurred incompletely (73 percent) over three age groups (II-IV). The release of tagged pre-recruits in two consecutive years and subsequent return data, adjusted for non-reporting of tag recoveries, yielded the following 1970 post-recruit, instantaneous mortality parameters: total = 0.3750, fishing = 0.2445, natural = 0.1125. A comparison of total recruitment from southeastern Massachusetts flounder groups, derived from a population estimate and instantaneous total mortality rate, with recruitment from the Waquoit Bay-Eel Pond system indicated that the latter constituted less than one percent of the total required to maintain equilibrium catch.

77-000236 Welcomme, R. L. SOME GENERAL AND THEORETICAL CONSIDERATIONS ON THE FISH YIELD OF AFRICAN RIVERS. J. Fish. Biol. 8 (5): 351-364. May 1976. SFA 22(1)
[Fish. Res. Environ. Div., Dep. Fish., FAO, Rome, Italy] The factors regulating fish production from river systems remain poorly studied and understood. Rivers conform to physical and chemical laws which determine their morphology. From these laws relationships are calculated which estimate the total length and number of streams of different order on the African continent. Edaphic factors vary less than morphological ones and the chemical and physical conditions in the major river channels tend to resemble each other closely. The present catch from African rivers, evaluated from catch statistics, by country and by river system, resembles a theoretical figure derived from the basin area. However, these statistics are drawn only from major fisheries and there remain a very large number of smaller streams whose production does not enter into this calculation. A theoretical approach to this problem is proposed which gives an estimate of annual yield of 530,000 t of fish at present levels of catch. Deviations from the theoretical yield in individual river systems arise from differences in both edaphic and morphological characteristics.

77-000237 Yamagishi, H. EXPERIMENTAL STUDY ON POPULATION DYNAMICS IN THE GUPPY, /POECILIA RETICULATA/ (PETERS). EFFECT OF SHELTERS ON THE INCREASE OF POPULATION DENSITY. J. Fish. Biol. 9 (1): 51-65. July 1976. SFA 22(1)
[Dep. Zool., Fac. Med., Teikyo Univ., Hachioji, tokyo 192-03, Japan] To study mass culture of the guppy, /Poecilia reticulata/ (Peters) for use in mosquito control, the population dynamics of the fish were studied in 1000 l polycarbonate tanks with and without shelters for fry, under conditions of constant temperature and filtration of water, and sufficient food supply. In the tank with shelters, the maximum density attained was 5.84 fish per l at the 77th week, when the initial population had been 25 males and 25 females. After this period the density began to decrease and dropped to 1904 fish per l at the 105th week. Conversely, in the tank without shelters, almost no

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increase in number took place when the population started with either 50 adult fish or 25 fry. The sex ratio of the guppies in the 1000 l tank with shelters varied. In particular, females increased in relation to male when the fry which had been produced in large quantities became sexually mature. The intervals between spawning averaged 38 days with a range of 26 to 90 days. An equation, log /Y/ = 0.0443/X/ - 0.2968 expresses the relationship between the number of young in the brood and the body length of females.

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

77-000238 Bams, R. A. SURVIVAL AND PROPENSITY FOR HOMING AS AFFECTED BY PRESENCE OR ABSENCE OF LOCALLY ADAPTED PATERNAL GENES IN TWO TRANSPLANTED POPULATIONS OF PINK SALMON (/ONCORHYNCHUS GORBUSCHA/) J. Fish. Res. Board Can. 33 (12): 2716-2725. Dec. 1976. In English with French summ. SFA 22(1)
[Dep. Environ., Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] An experiment was carried out on pink salmon (/Oncorhynchus gorbuscha/) at the Isolum River, Comox Bay, B.C., comparing an introduced pure donor stock with a hybrid stock created by crossing females from the donor with males of the local residual stock. Progeny of both treatments were raised in gravel incubators and released as unfed fry. Upon return from the ocean, marked fish were recaptured from catch and escapement. At the fry stage times of emergence differed, but mean fry lengths, weights, and stages of development were the same in both treatments. Survivals from fry to returning (coastal) adult were identical and comparable to that of other years, as was timing of adult migrations. Large differences occurred in returns to the river. At the hatchery stream the expected relative rate of return of the hybrid was /p/ = 0.53, observed /p/ = 0.91. Returns to the river below the hatchery stream also favored the local genotype, but less strongly so. The results demonstrated that 1) imprinting alone brought back some pure donor stock, 2) addition of the local male genetic complement improved return to the natal river system to a normal level, and 3) the male complement alone was not sufficient to achieve normal accuracy of return to the natal tributary within the system. "Hybrid" transplants may hold considerable potential for salmon rehabilitation and enhancement, but genetic and managerial implications should be carefully evaluated. Possibilities exist of seriously affecting fitness and abundance of other stocks and ecosystems.

77-000239 Cadwallader, P. L. BREEDING BIOLOGY OF A NON-DIADROMOUS GALAXIID, /GALAXIAS VULGARIS/ STOKELL, IN A NEW ZEALAND RIVER. J. Fish. Biol. 8 (2): 157-177. Feb. 1976. SFA 22(1)
[Fish. Wildl. Div., Snobs Creek Freshwater Fish. Res. Stn., Private Bag 20, Alexandra, Victoria, 3714, Australia] In the Glentui River, Canterbury, New Zealand, /Galaxias vulgaris/ Stokell Spawned in late winter and early spring (from July to September), the onset of spawning being temperature-dependent. No females matured in their first year, but 95 and 68 percent of age 0+ males were mature in consecutive years. With the exception of one female, all fish aged 1+ and older spawned. In mature fish, ovaries reached nearly 23 percent, and testes 11 percent of somatic weight. Maturity in males depended on size, whereas in females, age appeared to be the major factor affecting maturity. Recruitment eggs for next season's spawning were distinct from primary oocytes soon after the ripe eggs were shed. Egg numbers varied between 284 and 1911 per fish, and weight was the best indicator of fecundity. Sex ratios of whole samples were not

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significantly different from 1:1, but ratios of potential spawners revealed an excess of males, due mainly to the presence of age 0+ fish. Age 0+ males probably play an important role in adverse conditions and act as a form of insurance by significantly increasing the proportion of ripe males, thereby ensuring that all eggs are fertilized. The nest, egg mass and behaviour during the spawning period are described. More than one female may lay eggs in each nest and it is probable that each egg mass receives sperm from more than one male. It is suggested that the presence of fewer and larger eggs in /G. vulgaris/, compared with the diadromous galaxiids, is the result of a more precise fertilization process.

77-000240 Campos, A. G.; Bashirullah, A. K. M. BIOLOGIA DEL PARGO /LUTJANUS GRISEUS/ (LINN.) DE LA ISLA DE CUBAGUA, VENEZUELE. II. MADURACION SEXUAL Y FECUNDIDAD. [BIOLOGY OF /LUTJANUS GRISEUS/ (LINN.) OF THE CUBAGUA ISLAND, VENEZUELA. II. SEXUAL MATURATION AND FECUNDITY.] Bol. Inst. Oceanogr. Univ. Oriente Cumana 14 (1): 109-116. June 1975. In Spanish with English summ. SFA 22(1)
[Cent. Invest. Pesqueras, Cumana, Venezuela] /Lutjanus griseus/ was collected monthly from the Cubagua Island, Venezuela, from February, 1973 to January, 1974. Of the total 263 specimens collected, 33.84 percent and 66.16 percent were male and female respectively. Majority of the gonadal samples were of early stage of maturity. Fish seems to spawn from the month of July and continue for several months. The number of eggs vary from fish to fish but the fecundity seems to be related to the body weight and the total length.

77-000241 Du Buit, M. H. THE OVARIAN CYCLE OF THE CUCKOO RAY, /RAJA NAEVUS/ (MULLER AND HENLE), IN THE CELTIC SEA. J. Fish. Biol. 8 (3): 199-207. Mar. 1976. SFA 22(1)
[Cent. Natl. Rech. Sci. Lab. Biol. Mar., 29182 Concarneau, France] One hundred female /Raja naevus/ from the South Celtic Sea were examined every month for 14 consecutive months, for the characteristics of their ovarian cycle. Egg-laying occupied more than half of the cycle. All females followed the same genital cycle but independently of each other. On the average 56 percent of adult females were at egg-laying stage at any time throughout the year. Fecundity is estimated at 90 eggs a year.

77-000242 Elliott, J. M. THE DOWNSTREAM DRIFTING OF EGGS OF BROWN TROUT, /SALMO TRUTTA/ L. J. Fish. Biol. 9 (1): 45-50. July 1976. SFA 22(1)
[Freshwater Biol. Assoc., Ambleside, Cumbria LA22 OLP, England] The occurrence of eggs in the drift samples was not related to fluctuations in flow rates, But was probably related to the presence of eggs in the gravel. Both the number (/Y/ eggs $3h^{-1}$) and density (/Y/ eggs $100^{-1}m^{-3}$) of eggs in the drift samples increased with increasing water velocity (/V/m sec^{-1}), and the relationship between the two variables was well described by the regression equation /Y/ = /a/ /V/ to the /b/ where /a/ and /b/ are constants. Comparisons were made between two streams and different years.

77-000243 Erman, D. C.; Hawthorne, V. M. THE QUANTITATIVE IMPORTANCE OF AN INTERMITTENT STREAM IN THE SPAWNING OF RAINBOW TROUT. Trans. Am. Fish. Soc. 105 (6): 675-681. Nov. 1976. SFA 22(1)
[Dep. Forestry Conserv., Univ. Calif., Berkeley 94720] From 1972 to 1975, an estimated 39-47 percent of the adult rainbow trout (/Salmo gairdneri/) in Sagehen Creek spawned in an intermittent stream--Kiln Meadow Tributary--while several permanently flowing tributaries attracted only 10-15 percent of the run. The balance of the fish presumably spawn in the upper reaches of the main stream. Kiln Meadow Tributary drains a south-facing slope, and peak runoff from snow melt occurs early. This may be one factor that attracts spawning fish. The absence of competition from brook trout, which cannot spawn in Kiln Meadow Tributary in the fall, may enhance the value of this watercourse for rearing young rainbow trout. The number of spawning rainbows in Kiln Meadow Tributary declined from 707 in 1972 to 254 in 1975. Two large year classes were present in 1972 and 1973 following winter floods in preceding winters. Males matured a year earlier than females. Males outnumbered females in every year: the sex ratio in mature fish varied from 2.4:1 to 4.9:1. Repeat spawners to Kiln Meadow Tributary ranged from 25 percent to 28 percent of the run.

77-000244 Glenn, C. L.; Williams, R. R. G. FECUNDITY OF MOONEYE, /HIODON TERGISUS/, IN THE ASSINIBOINE RIVER. Can. J. Zool. 54 (2): 156-161. Feb. 1976. In English with French summ. SFA 22(1)
[Dep. Zool., Brandon Univ., Brandon, MB, Canada] Age at sexual maturity, seasonal gonadal development, and fecundity estimates of mooneye were determined from 695 samples captured in the Assiniboine River between November 17, 1972, and November 2, 1973. Most mooneye became sexually mature in their 4th (III+) or 5th (IV+) year of life, with more males mature at age III+ than females. During 1973, spawning began after May 8 and was completed by June 12. The peak spawning activity occured during mid-May when water temperatures ranged from 10 to 13°C. All age groups of sexually mature females had rapid ovarian development during the summer months with about 80 percent of maximum ovarian weight present by October 17. Ripe ova have a mean diameter of 1.98 ± 0.07 mm. The mean annual total fecundity of Assiniboine River mooneye was about 5000-9000 ova per female. The mean annual relative fecundity was about 2000-2400 ova per 100 g body weight.

77-000245 Hancock, R. S.; Jones, J. W.; Shaw, R. A PRELIMINARY REPORT ON THE SPAWNING BEHAVIOUR AND NATURE OF SEXUAL SELECTION IN THE BARBEL, /BARBUS BARBUS/ (L.). J. Fish. Biol. 9 (1): 21-28. July 1976. SFA 22(1)
[Fish. Unit, Dep. Zool,. Univ. Liverpool, Liverpool L69 3BX, England] In the spring of 1974 the migration and spawning behaviour of barbel, /Barbus barbus/ (L.) were observed. The migration and behaviour of males prior to the spawning attempts may be strategies designed to increase the quota of receptive females experienced by each male. Spawning attempts were divided into two categories: successful and failed. Successful attempts comprised six sequential sub-events: approach period, pre-spawning phase, spawning, post-spawning phase, dispersal period and inter-spawning period. The spawning and post-spawning phases did not occur in a failed attempt. The success or failure of attempts was dependent upon the number of males present. The advantage gained by females abandoning attempts when the male densities were high is discussed. In both the pre-spawning phase of failed attempts and the post-spawning phase of successful attempts, males attempted to drive away other male competitors by the use of male 'chase away' interactions.

77-000246 Hay, D. E.; McPhail, J. D. MATE SELECTION IN THE THREESPINE STICKLEBACKS (/GASTEROSTEUS/). Can. J. Zool. 53 (4): 441-450. Apr. 1975. In English with French Summ. SFA 22(1)
[Dep. Zool., Univ. Western Ontario, London CN N6A 3K7, Canada] Earlier studies suggest that the freshwater form of the threespine stickleback (/Gasterosteus aculeatus/) may be reproductively isolated from the anadromous form. In this study, assortative mating is examined as a possible isolating mechanism between the two forms. Mate selection tests were conducted in which (1) courting males were simultaneously exposed to receptive females of both forms, and (2) receptive females were simultaneously exposed to both forms of courting males. The results demonstrate clearly that in choice situations matings between similar phenotypes are more likely than matings between dissimilar phenotypes.

77-000247 Keenleyside, M. H. A.; Prince, C. E. SPAWNING-SITE SELECTION IN RELATION TO PARENTAL CARE OF EGGS IN /AEQUIDENS PARAGUAYENSIS/ (PISCES: CICHLIDAE). Can. J. Zool. 54 (12): 2135-2139. Dec. 1976. In English with French summ. SFA 22(1)
[Dep. Zool., Univ. West. Ontario, London, ON N6A 5B7, Canada] /Aequidens paraguayensis/ laid their eggs on small rather than large, and unweighted rather than weighted artificial leaves. Before spawning the fish moved available leaf litter into the deeper section of a two-depth aquarium. After spawning the parents moved the egg-bearing leaf into areas of relatively deep water and dense cover, especially in response to the presentation of a predator model. Female parents moved the leaf with eggs more often, but performed fewer aggressive acts towards the predator model, than male parents did. All of these behaviours are seen as adaptations to counter egg predation, and possibly also to cope with rapid changes in water levels, which frequently occur in the natural habitat.

77-000248 Kormilin, V. V. FECUNDITY OF THE "BALKHASH MARINKA" (/SCHIZOTHORAX ARGENTATUS/). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 730-739. 1975. SFA 22(1)
[Kazakh Fish. Res. Inst., Kazakh, USSR] The fecundity dynamics of the "Balkhash marinka" (/Schizothorax argentatus/) has been investigated. It has been established that fecundity is closely related to the feeding conditions of the spawners in the year preceeding spawning. In particular, a positive correlation is noted between fecundity and Fulton's condition factor and the growth rate of spawners. The correlation between fecundity and the fatness of females is expressed by a curve. The positive correlation between these characters for the younger age groups (7-10 years) is replaced by a negative correlation in the older fish (11-14 years).

77-000249 Kuznetsov, V. A. THE REPRODUCTION, DISTRIBUTION AND GROWTH OF JUVENILE FISH OF SOME UNCOMMON SPECIES FROM SVIYAGA BAY, KUYBYSHEV RESERVOIR. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 950-962. 1975. SFA 22(1)
[Dep. Vert. Zool., Kazan State Univ., USSR] Data are presented on spawning times, sites and conditions and on the distribution and growth of the young of the chub, /Leuciscus cephalus/, the rudd, Scardinius erythrophthalmus/, the tench, /Tinca tinca/, the "undermouth", /Chondrostoma nasus/, the crucian carp, /Carassius carassius/, the wild carp, /Cyprinus carpio/, and the sheatfish, /Silurus glanis/, in Sviyaga Bay, Kuybyshev reservoir. Some questions of the ecology of the wild goldfish, /Carassius auratus/, and the Burbot, /Lota lota/, are considered.

77-000250 Nezdoliy, V. K.; Mitrofanov, V. P. NATURAL REPRODUCTION OF THE GRASS CARP, /CTENOPHARYNGODON IDELLA/, IN THE ILI RIVER. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 927-933. 1975. SFA 22(1)

[Dep. Hydrobicl. Ichthyol., Kazakh Univ., Alma-Ata, USSR] On the basis of a study of the downstream drift of the eggs, prolarvae and larvae of fish in the River Ili, the presence of a self-reproducing population of the grass carp, /Ctenopharyngodon idella/, in Kapchagay reservoir has been inferred for the first time. This is the fourth reservoir in the USSR, after those of the Amu Darya, Kuban and Lower Volga where the natural spawning of this valuable acclimatized fish has been recorded.

77-000251 Scott, D. B. C.; Fuller, J. D. THE REPRODUCTIVE BIOLOGY OF /SCLEROPAGES FORMOSUS/ (MULLER & SCHLEGEL) (OSTEOGLOSSOMORPHA, OSTEOGLOSSIDAE) IN MALAYA, AND THE MORPHOLOGY OF ITS PITUITARY GLAND. J. Fish. Biol. 8 (1): 45-53. Jan. 1976. SFA 22(1)

[Dep. Zool., The University, St. Andrews, Scotland] The fish spawn in the Tasek Bera waterways of Pahang, Malaysia during the rainy season beginning in August. Young fish are incubated in the mouth of the male parent until free-swimming. Males mature in their 2+ year, when 30-45 cm in length. In mature specimens the testis is small, and little sperm is produced. Some females mature in their 2+ year, although at that time, most have only reached the stage or secondary oocyte production. The chorion and folicular granulosa of secondary oocytes are deeply invaginated into the cytoplasm. All fish spawn in their 3+ year, when 45-60 cm in length. The single ripe ovary contains 20-30 ova, each 1.9 cm in diameter. No fish of 4+ years were caught, which may be the result of mortality or emigration, or due to extraneous causes such as selectivity in the fishing techniques used. The pituitary gland accords with the generalized teleost pattern and embryonic development.--From abstr.

77-000252 Smith, S. L. BEHAVIORAL SUPPRESSION OF SPAWNING IN LARGEMOUTH BASS BY INTERSPECIFIC COMPETITION FOR SPACE WITHIN SPAWNING AREAS. Trans. Am. Fish. Soc. 105 (6): 682-685. Nov. 1976. SFA 22(1)

[Fla. Game Freshwater Fish Comm., Eustes 32726] Florida largemouth bass, /Micropterus salmoides floridanus/, fail to spawn in association with dense populations of stunted sunfish. A recent study indicated that a "physical factor" rather than a chemical factor may be responsible. Three hatchery ponds containing marked bass were stocked at different points in the bass reproductive cycle with concentrations of sunfish known to suppress spawning. It was determined that reduced or complete inhibition of spawning of largemouth bass is related to interspecific population densities in the spawning area and is behavioral in nature. Suppression is linked to aggressive interaction with other species, primarily affects the male bass, and is effective in suppressing the spawning behavior sequence even before nest construction.

77-000253 Went, A. E. J. THE RECAPTURE OF BRITISH SALMON IN IRISH WATERS. J. Fish. Biol. 8 (4): 311-316. Apr. 1976. SFA 22(1)

[Dep. Agric. Fish., Agriculture House, Dublin, Ireland] In the years 1972 to 1974, inclusive, a total of 50 salmon originally tagged as smolts in British rivers were recaptured in Irish waters. Although it is not possible to give precise reasons for these changes, some factors can be largely eliminated. The results do, however, indicate that salmon and grilse derived from British rivers occur in Irish inshore waters to a greater extent than was generally accepted.

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

77-000254 Churikov, A. A. FEATURES OF THE DOWNSTREAM MIGRATION OF YOUNG SALMON OF THE GENUS /ONCORHYNCHUS/ FROM THE RIVERS OF THE NORTHEAST COAST OF SAKHALIN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 963-970. 1975. SFA 22(1)
[VNIRO, Moscow, USSR] Data are presented on the times of the downstream migration, the size and age of the downstream migrants of masu, /Oncorhynchus masou/, coho, /O. kisutch/, and chum, /O. keta/. The characteristics of their feeding in the mouths of rivers, the biotopes of the downstream migrants and the thermal regime of the rivers and proestuarine sections of the sea during the period of downstream migration are described.

77-000255 Engel, S.; Magnuson, J. J. VERTICAL AND HORIZONTAL DISTRIBUTIONS OF COHO SALMON (/ONCORHYNCHUS KISUTCH/), YELLOW PERCH (/PERCA FLAVESCENS/), AND CISCO (/COREGONUS ARTEDII/) IN PALLETTE LAKE, WISCONSIN. J. Fish. Res. Board Can. 33 (12): 2710-2715. Dec. 1976. In English with French summ. SFA 22(1)
[Dep. Nat. Resour., Madison, WI 53711] Coho salmon (/Oncorhynchus kisutch/), stocked in Pallette Lake, Wisconsin, remained inshore in April and early May, moved offshore in late May and June, and returned to shore in October. From June to September the vertical distribution of offshore coho salmon overlapped that of yellow perch (/Perca flavescens/) and cisco (/Coregonus artedii/). Yellow perch were gillnetted mainly in epilimnetic water of 16-22C; coho salmon and cisco were mostly caught in metalimnetic water of 12-17 and 8-12C, respectively. Vertical separation broke down during other months of the year. From June to September diel, horizontal movements were found for yellow perch within the epilimnion and for cisco within the metalimnion. Yellow perch moved offshore around sunrise and onshore around sunset; cisco moved toward shore around sunrise and away from shore around sunset. Yellow perch were mainly active during the day and cisco at night. Perch and cisco were, therefore, largely temporally and spatially segregated from each other but not from coho salmon.

77-000256 Green, J. M. RESTRICTED MOVEMENTS AND HOMING OF THE CUNNER, /TAUTOGOLABRUS ADSPERSUS/ (WALBAUM) (PISCES: LABRIDAE). Can. J. Zool. 53 (10): 1427-1431. Oct. 1975. In English with French summ. SFA 22(1)
[Mar. Sci. Lab., Memorial Univ., St. John's, NF, Canada] Tagging studies showed that cunners (/Tautogolabrus adspersus/) occupied small home ranges and that they would return to their home sites after displacements of at least 4 km. Cunners successfully homed after being held in aquaria for 9 months. They do not appear to be able to home across deep water.

77-000257 Randolph, K. N.; Clemens, H. P. HOME AREAS AND SWIMWAYS IN CHANNEL CATFISH CULTURE PONDS. Trans. Am. Fish. Soc. 105 (6): 725-730. Nov. 1976. SFA 22(1)

[Dep. Zool., Univ. Okla., 730 Van Fleet Oval, Norman 73069] Three distinct behavior patterns were recognized in the daily routine of channel catfish (/Ictalurus punctatus/) in culture ponds: (1) occupancy of home areas; (2) daily trip to the feeding station; and (3) feeding. When the fish were not in home areas they were going to or from the feeding station by specific routes or swimways. The pond bottom in home areas and swimways was hard and free from silt while the remainder of the pond bottom had a layer of soft mud and silt. Ponds stocked with similar size fish had fewer and larger home areas, and fewer but wider swimways, than ponds stocked with mixed sizes. In the spring and fall, home areas and swimways were in shallows but during summer and winter they were in deeper parts of the pond.

FOODS AND FEEDING

77-000258 Appelbaum, S. DAS FRESSVERHALTEN VON KARPFENLARVEN UND DIE MOEGLICHKEIT SIE AN TROCKENFUTTER ZU GEWOEHNEN. [THE FEEDING BEHAVIOUR OF CARP LARVAE AND THE POSSIBILITY OF ADAPTING THEM TO ARTIFICIAL FOOD.] Arch. Fischereiwiss. 27 (2): 133-141. Nov. 1976. In German with English summ. SFA 22(1)

[Zool. Inst., Univ. Hamburg, West Germany] The importance of visual stimuli in the feeding patterns of carp larvae was experimentally investigated. It was found that the absence of the optical and also other stimuli could not prevent the larvae from feeding, whether on artificial or on live food. As a result a search was set up for a suitable substitute food to replace Artemia which is a frequently used food for carp larvae in fishculture.

77-000259 Arawomo, G. A. O. FOOD AND FEEDING OF THREE /CITHARINUS/ SPECIES IN LAKE KAINJI, NIGERIA. J. Fish. Biol. 9 (1): 3-10. July 1976. SFA 22(1)

[Dep. Biol. Sci., Univ. Ife, Ile Ife, Nigeria] This paper provides information on the food and feeding habits of three /Citharinus/ species in Lake Kainji. A total number of 2357 specimens made up of 1628 /Citharinus citharus/, 705 /C. distichodoides/ and 24 /C. latus/ were examined. The majority of the fish caught by gill-netting had empty stomachs unlike those caught by cast-netting and electrofishing. The main food items were planktonic and epipelic blue-green and green algae. All the three species had similar feeding habits and also fed on the same items; their food varied with the seasons. /Citharinus/ spp. have high gut length/standard length ratios which are adaptations to the microphagous and planktivorous feeding habits.

77-000260 Carr, W. E. S.; Gondeck, A. R.; Delaney, R. L. CHEMICAL STIMULATION OF FEEDING BEHAVIOR IN THE PINFISH, /LAGODON RHOMBOIDES/: A NEW APPROACH TO AN OLD PROBLEM. Comp. Biochem. Physiol. A Comp. Physiol. 54 (2): 161-166. 1976. SFA 22(1)

[C. V. Whitney Mar. Lab., Univ. Fla. at Marineland, Rt. 1, Box 121, St. Augustine 32084] A new bioassay procedure is described for studying chemically-induced feeding behavior in the pinfish, /Lagodon rhomboides/. The procedure involves the introduction of stimulant through a small perforated rubber bulb and an automated recording of the number of times the fish strike the bulb. The quantitative nature of the procedure and the relative reliability of alternative testing regimes are discussed. Assays of extracts prepared in a similar manner

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from seven animals (four phyla) revealed that considerable differences in potency existed. The most potent extract (shrimp) was approximately 3 times as effective as that of crab and greater than 10 times as effective as extracts of clam, oyster, whelk, mullet or sea urchin. The major stimulants in five extracts were found to be substances of less than /ca./ 10,000 molecular weight.

77-000261 Carr, W. E. S.; Chaney, T. B. CHEMICAL STIMULATION OF FEEDING BEHAVIOR IN THE PINFISH, /LAGODON RHOMBIODES/: CHARACTERIZATION AND IDENTIFICATION OF STIMULATORY SUBSTANCES EXTRACTED FROM SHRIMP. Comp. Biochem. Physiol. A Comp. Physiol. 54 (4): 437-441. 1976. SFA 22(1)
[C. V. Whitney Mar. Lab., Univ. Fla. at Marineland, Rt. 1, Box 121, St. Augustine 32084] Substances in shrimp extract that induce feeding behavior in the pinfish, /Lagodon rhomboides/, had amino acid-like properties as evidenced by molecular weights of less than /ca./ 1000, methanol solubility, stability to acid hydrolysis, retention on a cation exchange column and their non-volatile nature. A quantitative analysis of the 20 amino acids present in shrimp extract provided specific concentrations used to prepare artificial solutions whose potencies were compared in a quantitative manner to the extract itself. A mixture was resolved that contained five amino acids plus bentaine which accounted for 20-25 percent of the activity of the extract. Of the individual substances in the mixture, only betaine had significant activity when tested alone yet it accounted for less than 10 percent of the activity of the mixture. Quantitative data on the combined effects of various [combinations] of the six substances are provided.--From abstr.

77-000262 Chinarina, A. D.; Troshicheva, N. V. FOOD-PROCURING REACTIONS OF THE ATLANTIC COD, /GADUS MORHUA MORHUA/, AND THE SHORT HORN SCULPIN, /MYOXOCEPHALUS SCORPIUS/, IN THE ABSENCE OF VISUAL RECEPTION. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 990-997. 1975. SFA 22(1)
[Murmansk Inst. Ocean Biol., Dal'niye Zelentsy, USSR] The role of visual food signals in fish from different ecological groups, the Atlantic cod, /Gadus morhua morhua/, and the short horn sculpin, /Myoxocephalus scorpius/, are shown under experimental conditions. In the absence of visual reception, the short horn sculpin neither finds nor catches food; totally blinded Atlantic cod eats both stationary and mobile prey.

77-000263 Dubitskiy, A. M.; Abdil'dayev, M. A. THE USE OF /APLOCHEILUS LATIPES/(?) TO CONTROL MOSQUITOES LARVAE IN SOUTHEASTERN KAZAKHSTAN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 844-847. 1975. SFA 22(1)
[Inst. Zool., Kazakh Acad. Sci., Alma-Ata, USSR]

77-000264 Glenn, C. L. SEASONAL DIETS OF MOONEYE, /HIODON TERGISUS/, IN THE ASSINIBOINE RIVER. Can. J. Zool. 53 (3): 232-237. Mar. 1975. In English with French summ. SFA 22(1)
[Dep. Zool., Brandon Univ., Brandon, MB, Canada] Stomach analyses of 665 mooneye (/Hiodon tergisus/) netted from the Assiniboine River during a 12-month period indicate that mooneye fed mainly on insects. Corixids occurred in about 80 percent of the stomachs that contained food and formed a bulk of the ingesta. Other insects eaten were coleopterans, ephemeropterans, dipterans, odonatans, plecopterans, and hymenopterans. Amphipods, crayfish, and plant materials were other items taken. Mooneye fed during each month of the year but vernal

77-000264 CONTINUED
(April-June) and autumnal (September-November) peaks occurred. There were significant seasonal variations in percentages of stomachs with food and in the mean weight of stomach contents. Monthly mean food weights were significantly greater for adult male mooneye during the autumnal peak.

77-000265 Guziur, J. THE FEEDING OF TWO YEAR OLD CARP (/CYPRINUS CARPIO/ L.) IN A VENDACE LAKE KLAWOJ. Ekol. Pol. 24 (2): 211-235. 1976. In English with Polish summ. SFA 22(1)
[Inst. Ichthyol. Fish., Acad. Agric. Tech., Olsztyn, Poland] Animal food (mainly Mollusca, Chironomidae, Trichoptera, /Sialis/ sp.), which is on average 94 percent of the reconstructed food weight, is the most important in the food of two year old carp. The remaining 6 percent is plant food (mainly macrophytes). In particular years of the study the quality of consumed food did not vary much. The weight percentage of particular components and their frequency of occurrence (feeding) changes slightly in consecutive seasons of the year. The feeding by the carp is most intense between June and August. A thermocline is a thermal barrier significantly limiting the vertical feeding range of the carp in this type of water body. The littoral zone is the main feeding ground for two year old carp almost entire the whole vegetation season. The carp feeds sporadically in other zones.

77-000266 Kislalioglu, M.; Gibson, R. N. PREY 'HANDLING TIME' AND ITS IMPORTANCE IN FOOD SELECTION BY THE 15-SPINED STICKLEBACK, /SPINACHIA SPINACHIA/ (L.). J. Exp. Mar. Biol. Ecol. 25 (2): 151-158. 1 Dec. 1976. SFA 22(1)
[Minist. Food Agric. Anim. Prod., Gen. Dir. Water Prod., Yenisehir, Ankara, Turkey] The time taken to manipulate and swallow a prey item, termed 'handling time', increases with decreasing hunger in /Spinachia spinachia (L.). Handling time is also dependent upon the size of the prey in relation to the size of the mouth. Estimates of the optimum prey size, defined as that prey which minimizes the value of the 'cost/benefit' ratio of handling time/mg dry weight of prey, agrees closely with the mean prey sizes of wild fish. Optimum prey size was found to be approximately half the maximum swallowing capacity of the mouth. The nature of the relationship between the cost/benefit ratio and prey weight was used to explain the facts that the size range of prey eaten is dependent upon fish length and that decreasing hunger results in fish becoming increasingly selective with respect to prey size.

77-000267 Kislalioglu, M.; Gibson, R. N. SOME FACTORS GOVERNING PREY SELECTION BY THE 15-SPINED STICKLEBACK, /SPINACHIA SPINACHIA (L.). J. Exp. Mar. Biol. Ecol. 25 (2): 159-169. 1 Dec. 1976. SFA 22(1)
[Minist. Food Agric. Anim. Prod., Gen. Dir. Water Prod., Yenisehir, Ankara, Turkey] Using mysids as prey, the relative importance of four characters governing prey selection by /Spinachia spinachia/ (L.) were examined. Moving prey were taken in preference to stationary prey of equal length and when the fish were hungry they could be induced to take moving non-optimum sized prey in preference to optimum sized stationary ones. A comparison of the frequency of attack on portions of the prey showed that heads were preferred to tails and darkened mysids to light ones. The order of preference was dark colour, greater than head greater than light colour greater than tail and there was some indication that the stimuli presented by these characters were additive. It is concluded that the fish attacked the head of the prey because of its shape (greater thickness and presence of appendages) and darker colour. The colour of the prey did not effect the size (length) of prey taken. In general, the stimuli presented by the four

77-000267 CONTINUED
characters could be ranked in the order movement ≥ length greater than colour greater than shape.

77-000268 Kuperman, B. I. EXPERIENCE OF THE USE OF PARASITES FOR QUANTITATIVE ESTIMATION OF THE FEEDING OF FISHES. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 838-841. 1975. SFA 22(1)
[Inst. Biol. Inland Waters, USSR Acad. Sci., Borok, USSR]

77-000269 Mendelson, J. FEEDING RELATIONSHIPS AMONG SPECIES OF /NOTROPIS/ (PISCES: CYPRINIDAE) IN A WISCONSIN STREAM. Ecol. Monogr. 45 (3): 199-230. 1975. SFA 22(1)
[Coll. Environ. Appl. Sci., Governors State Univ., Park Forest South, IL 60466] The relationship between spatial preference and diet in four species of the genus /Notropis/ (Pisces: Cyprinidae) was investigated in Roxbury Creek, a small stream in southern Wisconsin. Characteristic spatial distributions for each species were determined from frequency of catch in unbaited minnow traps set at varying heights and locations in the pools of the stream. Data on food habits of /Notropis/ gathered from stomach content analysis of fishes collected over the same period indicate that 73 percent of the invertebrate genera present are utilized by /Notropis/ species in Roxbury Creek. Considerable overlap exists in the invertebrate genera chosen by the four species, and strong overall correlations between species are found in the importance of various orders of aquatic invertebrates in the diet. Differences in food habits relate principally to differences in space utilization. Midwater species tend to feed on drifting chironomids, copepods, terrestrials, and other animals found in the water column. Bottom-dwelling fishes feed on benthic genera of chironomids, tipulids, oligochaetes, and other organisms found commonly in pool substrates. It is concluded that spatial rather than taxonomic considerations are the chief determinants of prey selection in these four species, and that this pattern of resource subdivision acts to reduce competition in sympatric, syntopic populations of these fishes. Data from other Wisconsin streams, from aquarium observations, and from literature review suggest that multispecific assemblages of mutually responsive species like the ones in Roxbury Creek are common in /Notropis/.--From abstr.

77-000270 Randolph, K. N.; Clemens, H. P. SOME FACTORS INFLUENCING THE FEEDING BEHAVIOR OF CHANNEL CATFISH IN CULTURE PONDS. Trans. Am. Fish. Soc. 105 (6): 718-724. Nov. 1976. SFA 22(1)
[Dep. Zool., Univ. Okla., 730 Van Fleet Oval, Norman 73069] Throughout the growing season, from March to October, marked fish usually made a daily trip to the feeding station. In the spring, they did not use the demand feeders until temperatures reached 12 C and they stopped demand feeding in the fall at approximatley 22 C. In the spring, intermittent feeding appeared to be primarily temperature related. At cold temperatures fish did not feed daily. After the water had warmed to 22 C fish fed on a daily basis. During summer, low oxygen concentrations often caused fish to adjust or miss their daily feeding period. Feeding was reduced at oxygen values below 5 mg/liter, but fish occasionally fed at values as low as 3 mg/liter. Large fish were dominant in feeding and small fish usually had to wait. A daily feeding pattern for each size fish was established, and since each fish fed approximately the same time day after day it became acclimated to the prevailing oxygen and temperature values. Interruptions of this feeding routine were observed when oxygen or temperature values fell below those values at which the fish was accustomed to feeding. This could affect all or part of the

77-000270 CONTINUED
hierarchical spectrum. Hence, environmental isolation, heretofore undescribed in catfish culture ponds, can operate to reduce the effect of a hierarchy.

77-000271 Sirotenko, M. D.; Budnichenko, E. V. THE QUANTITATIVE INDICES CHARACTERIZING THE FEEDING OF THE ANCHOVY, /ENGRAULIS ENCRASICHOLUS PONTICUS/, IN THE BLACK SEA. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 970-980. 1975. SFA 22(1)
[AzCherNIRO, Kerch, USSR] The feeding of the Black Sea anchovy, /Engraulis encrasicholus ponticus/, in the pre-spawning, spawning and post-spawning periods was studied. A broad feeding spectrum was noted in all seasons of the year; however, during the foraging period Copepoda predominate in its food.

77-000272 Stein, R. A.; Magnuson, J. J. BEHAVIORAL RESPONSE OF CRAYFISH TO A FISH PREDATOR. Ecology 57 (4): 751-761. 1976. SFA 22(1)
[Dep. Zool., Ohio State Univ., Columbus 43210] In laboratory aquaria, smallmouth bass (/Micropterus dolomieui/) influenced activity, substrate selection, behavior, and food consumption of crayfish (/Orconectes propinquus/) of different sizes and sexes. In the presence of a predator, crayfish selected substrates affording most protection, significantly modified the frequency of various behavior patterns, and reduced their overall activity. Degree of response of crayfish appeared correlated with liability to predation, i.e., small, vulnerable crayfish were most affected, whereas large, less vulnerable crayfish were least affected. Field observations correlated well with laboratory findings, suggesting that predators affect distribution and behavior of crayfish in natural communities. By affecting several trophic levels within aquatic systems, influence of predators goes beyond simple interactions of predator and prey.--From abstr.

77-000273 Tiews, K.; Divino, P.; Ronquillo, I. A.; Marquez, J. ON THE FOOD AND FEEDING HABITS OF EIGHT SPECIES OF /LEIOGNATHUS/ FOUND IN MANILA BAY AND SAN MIGUEL BAY. Philipp. J. Fish. 11 (1-2): 62-72. 973.
[Inst. Kusten Binnenfisch. Bundesforschungsanst. Fisch., Hamburg, West Germany] This paper describes and tabulates the food organisms and notes specific feeding habits of /Leiognathus splendens/, /L. Bindus/, /L. insidiator/, /L. ruconious/, /L. blochii/, /L. daura/, /L. equulus/ and /L. leuciscus/, noting particularly the differences between the consumption of plankton and benthos by several species.

AGE AND GROWTH

77-000274 Bashirullah, A. K. M. BIOLOGY OF /LUTJANUS GRISEUS/ (L.) OF THE CUBAGUA ISLAND, VENEZUELA. I. LENGTH-WEIGHT, BODY LENGTH-GUT LENGTH RELATIONSHIPS AND CONDITION FACTOR. Bol. Inst. Oceanogr. Univ. Oriente Cumana. 14 (1): 101-107. June 1975. In English with Spanish summ. SFA 22(1)
[Inst. Oceanogr., Univ. Oriente, Cumana, Venezuela] The length-weight, body-length gut length relationship and condition factor of /Lutjanus griseus/ were based on the examination of 263 fish collected from the Cubagua Island. The length weight equation expressed logarithmically is: i) Log W = 3.24 x 10^{-5} + 2.86 Log L for male and ii) Log W = 7.04 x 10^{-5} + 2.73 Log L for female. The coefficient of

77-000274 CONTINUED
Condition factor K was found to be an average of 1.5103 for male and 1.4853 for female fish. Gut length rarely exceeds the total body length and exists a linear relationship between the total body length and the gut length of the fish.

77-000275 Chadwick, E. M. P. A COMPARISON OF GROWTH AND ABUNDANCE FOR TIDAL POOL FISHES IN CALIFORNIA AND BRITISH COLUMBIA. J. Fish. Biol. 8 (1): 27-34. Jan. 1976. SFA 22(1)
[Dep. Zool., Univ. Guelph, Guelph, ON, Canada] A qualitative comparison of species compositions, relative abundances, diversity and growth was made between tidal pool fishes collected in Port Renfrew, British Columbia and Bruels Point, California. The two most preponderant cottid species /Oligocottus maculosus/ and /Clinocottus globiceps/ were aged using vertebrae, from which back calculated growth values were obtained. Species from Port Renfrew were found to have a higher diversity index, greater species composition and abundance. No growth differences were found between the two localities despite the 1120 km (700 miles) separating them.

77-000276 Fritz, E. S.; Garside, E. T. COMPARISON OF AGE COMPOSITION, GROWTH, AND FECUNDITY BETWEEN TWO POPULATIONS EACH OF /FUNDULUS HETEROCLITUS/ AND /F. DIAPHANUS/ (PISCES: CYPRINODONTIDAE). Can. J. Zool. 53 (4): 361-369. Apr. 1975. In English with French summ. SFA 22(1)
[NMFS, U.S. Dep. Comm., Washington, DC 20235] Age composition, growth rate, length-weight relationship, and fecundity comparisons were made among samples of two cyprinodontid fishes, the mummichog (/Fundulus heteroclitus/) and the banded killifish (/F. diaphanus/), from brackish water and freshwater sympatric and allopatric populations. Comparisons indicate that growth, both length and weight, of mummichog was not affected by habitation in weakly brackish water, but fecundity was reduced. However, both growth and fecundity of banded killifish were greater in brackish water than in a typical freshwater environment.

77-000277 Mustafa, S.; Jafri, A. K. A STATISTICAL ANALYSIS OF THE MYOTOME THICKNESS-BODY LENGTH RELATIONSHIP IN A FRESHWATER MURREL, /OPHICEPHALUS STRIATUS/ BLOCH. Broteria Ser. Trimest. Cienc. Nat. 44 (3-4): 141-145. 1975. SFA 22(1)
[Dep. Zool., Aligarh Muslim Univ., Aligarh, India] Increase in thickness of the myotome of /Ophicephalus striatus/, a freshwater murrel, was related with a direct increase in the total body length. This correlation between the myotome thickness and body length was expressed by regression equations and the myoscomatic index. The body length in relation to the thickness of the myotome was found to be more in /O. striatus/ than in /O. punctatus/, a closely related species.--Summ.

77-000278 Treasurer, J. W. AGE, GROWTH AND LENGTH-WEIGHT RELATIONSHIP OF BROWN TROUT /SALMO TRUTTA/ (L.) IN THE LOCH OF STRATHBEG, ABERDEENSHIRE. J. Fish. Biol. 8 (3): 241-253. Mar. 1976. SFA 22(1)
[Dep. Zool., Univ. Aberdeen, Aberdeen, Scotland] Most age and growth studies on brown trout in British lakes have been restricted to highland or moorland areas. In the unusual environment of a coastal dune lake (Loch of Strathbeg, Aberbeenshire) the trout population was short-lived with few fish surviving longer than three years. Growth was rapid compared with other naturally-stocked lakes. Growth in length and weight differed between 1- and 2-migrants. Faster growth in

77-000278 CONTINUED
the burn was the factor causing early migration by 1-migrants (71 percent of population), but both groups grew at the same rate on entering the loch. The effect of gill-net selection on the estimation of the length-weight relationship was demonstrated. A small difference was found in the length-weight relationship among the mature stages. Factors responsible for rapid growth and small age-range of the population are discussed.

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

77-000279 Barron, R. J. C. THE OCCURRENCE OF THE ROCK GOBY, /GOBIUS PAGANELLUS/ L. 1758 AND THE TWO-SPOT GOBY, /CHAPARRUDO FLAVESCENS/ (FABRICIUS, 1779) IN THE BLACKWATER ESTUARY, ESSEX (S.E. ENGLAND). J. Fish. Biol. 8 (1): 93-95. Jan. 1976. SFA 22(1)
[Dep. Biol. Sci., Hatfield Polytech., Hatfield, Hertfordshire, AL10 9AB, England] The capture of a rock goby, /Gobius paganellus/, and two 'two-spot' gobies, /Chaparrudo flavescens/ from the upper Blackwater Estuary during the autumn of 1974 is reported. Reasons for their presence are discussed, since this appears to be the first record of /Gobius paganellus/ in the North Sea.

77-000280 Domanevskiy, L. N. THE FRILL SHARK, /CHLAMIDOSELACHUS ANGUINEUS/, FROM THE CAPE BLANC AREA (CENTRAL EASTERN ATLANTIC). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 1000-1002. 1975. SFA 22(1)
[AtlantNIRO, Kaliningrad, USSR]

77-000281 Encina, V. E. THE DISCOVERY AND DISTRIBUTION OF THE SPINY DOGFISH SHARK RESOURCE IN THE PHILIPPINES. Philipp. J. Fish. 11 (1-2): 127-141. 1973. SFA 22(1)
[Bur. Fish. Aquatic Resour., Intramuros, Manila 2801, Philippines] This paper traces the global distribution of spiny dogfish shark (Family Squalidae) species in the Pacific and Indian oceans since 1872 and the description of the spiny dogfish shark by Deania Jordan and Snyder in 1902. Likewise, it shows identification of the spiny dogfish shark species in the Philippines by Smith and Radcliffe in 1912, Albert Herre in 1922 and Henry Fowler in 1941. In April, 1975, the spiny dogfish shark caught by local fishermen was identified and described by Mrs. Salud Ganaden, of the Bureau of Fisheries and Aquatic Resources. This article also traces the discovery and identification of the spiny dogfish shark distributed in Philippine marine waters. A discussion of the economic value of the fish squalene oil is included. A program for the wise exploitation and conservation of this dollar-earning fishery is recommended.

77-000282 Franz, R.; Lee, D. S. A RELICT POPULATION OF THE MOTTLED SCULPIN, /COTTUS BAIRDI/, FROM THE MARYLAND COASTAL PLAIN. Chesapeake Sci. 17 (4): 301-302. Dec. 1976. SFA 22(1)
[Fla. State Mus., Univ. Fla., Gainesville 32611] A population of mottled sculpin, /Cottus bairdi/, in the central Delmarva Peninsula (Nanticoke drainage) is the only record of this species from the Atlantic Coastal Plain. Examination reveals that specimens have characteristics of both /C. bairdi/ and the problematic /C. girardi/. The presence of other Piedmont indicator-species in this general area suggest a relict Piedmont community.

77-000283 Kashkin, N. I. FINDS OF /PHOTOSTYLUS PYCNOPTERUS/ (PISCES, ALEPOCEPHALIDAE) IN THE NORTHEASTERN ATLANTIC, THE GULF OF MEXICO AND THE CARIBBEAN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 817-820. 1975. SFA 22(1)

77-000284 Medders, S. THE UNARMORED THREE-SPINED STICKLEBACK: PREY OF "PROGRESS". Natl. Parks Conserv. Mag. 50 (9): 14-16. Sept. 1976. SFA 22(1)
This article describes the status of /Gasterosteus aculeatus williamsoni/, an endangered fish found in the upper Santa Clara River, California, and the threats to its further survival.--RS

77-000285 Merriner, J. V.; Kriete, W. H.; Grant, G. C. SEASONALITY, ABUNDANCE, AND DIVERSITY OF FISHES IN THE PIANKATANK RIVER, VIRGINIA (1970-1971). Chesapeake Sci. 17 (4): 238-245. Dec. 1976. SFA 22(1)
[Va. Inst. Mar. Sci., Gloucester Point 23062] Bimonthly trawl catches at seven stations in the Piankatank River, Virginia, for the period July 1970 to May 1971 included 3417 specimens representing 41 species. Numeric and species abundance in the river reflected a seasonal pattern of species specific migrations with peak numerical abundance in September and a decline in marine fishes during winter. The effects of seasonal migrations by marine fishes and their interaction with resident fishes are reflected in diversity indices. Bimodiality in diversity was shown with highest diversity occurring at the upper and the lower stations and is attributed to stability of hydrographic factors in these two areas. Seasonal and areal fluctuations in diversity statistics within this small tributary to Chesapeake Bay, and in other East Coast areas, indicate that descriptive community ecology and diversity statistics must be coupled to be able to assess estuarine fish populations for indications of stress conditions.

77-000286 Sekharan, K. V. OBSERVATIONS ON THE OCCURRENCE AND HABITS OF JUVENILE FISHES IN THE NEARSHORE REGION OF THE MANDAPAM AREA. J. Bombay Nat. Hist. Soc. 72 (1): 83-89. Apr. 1975. SFA 22(1)
[Cent. Mar. Fish. Res. Inst., Cochin-18, India]

77-000287 Serenko, V. A.; Bekker, V. E. A NEW FIND OF THE RARE SPECIES /DIAPHUS ADENOMUS/ (MYCTOPHIDAE, OSTEICHTHYES). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 821-825. 1975. SFA 22(1)
[AtlantNIRO, Kaliningrad, USSR]

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

77-000288 Krykhtin, K. L. CAUSES OF PERIODIC FLUCTUATIONS IN THE ABUNDANCE OF THE NON-ANADROMOUS FISHES OF THE AMUR RIVER. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 826-829. 1975. SFA 22(1)
[TINRO, Khabarovsk, USSR]

77-000289 Kushlan, J. A. ENVIRONMENTAL STABILITY AND FISH COMMUNITY DIVERSITY. Ecology 57 (4): 821-825. 1976. SFA 22(1)
[Natl. Park Serv., Everglades Natl. Park, Homestead, FL 33030] Seasonal fluctuation of water level is the most critical environmental factor affecting the fish community of the Everglades marshes. During a 27-mo period of water-level stability, fish density decreased but biomass, average size of fish, species richness, and species diversity increased. These changes were accompanied by a functional shift from the dominance of small sized omnivorous species to the dominance of larger sized carnivorous fish. The changes resulted from immigration of large carnivorous species poorly adapted for survival in fluctuating marshes. Increased predation assumed the determining role in restructuring the community under environmentally stable conditions. The fish community of Everglades marshes oscillates between opposing tendencies of species domination, which depend on the degree of water level stability.

77-000290 Sale, P. F. THE EFFECT OF TERRITORIAL ADULT POMACENTRID FISHES ON THE RECRUITMENT AND SURVIVAL OF JUVENILES ON PATCHES OF CORAL RUBBLE. J. Exp. Mar. Biol. Ecol. 24 (3): 297-306. 1 Nov. 1976. SFA 22(1)
[Sch. Biol. Sci., Univ. Sydney, Sydney, N.S.W., Australia] /Pomacentrus wardi/ Whitley is one species of a guild of territorial herbivorous pomacentrid fishes which compete for space within patches of rubble substrata on reefs of the Great Barrier. An experiment has been made on a series of adjacent patches of rubble to assess the importance of the presence of adult residents on the recruitment and survival of juvenile /P. wardi/, and on the use of the rubble patch by non-territorial benthic-feeding fishes. Recruitment of juvenile /P. wardi/, and survival of experimentally added juvenile /P. wardi/ were both greater in patches from which all adult pomacentrids had been removed than in patches with undisturbed adult populations. Patches in which the removal of adults was only partially successful did not show these effects. Experimentally added juveniles survived only poorly, whether in undisturbed patches or in patches first denuded of adults. Denuded patches were visited by greater numbers of roving benthic-feeding fishes than were undisturbed patches. Numbers of adult pomacentrids varied little over a year in undisturbed patches, and recovered within six months in denuded patches. The results are discussed with reference to the coexistence of /P. wardi/ and other members of its guild.

77-000291 Shapiro, L. S. RELATIONSHIP OF EGG SURVIVAL AND YEAR-CLASS STRENGTH WITH REFERENCE TO THE BALTIC HERRING, /CLUPEA HARENGUS MEMBRAS/ OF VISTULA LAGOON. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 933-939. 1975. SFA 22(1)
[Atlant. NIRO, Kaliningrad, USSR] Two terms are defined: egg survival, the factually observed process of their mortality at all stages of embryogenesis, which is the result of the total action of all internal and external factors, and the capacity for survival of eggs, their intrinsic quality, a biological character. It is shown that both the survival rate of eggs of different females and their capacity for survival in different spawning seasons are very different. This explains the considerable fluctuations in the abundance of larvae in different years (and consequently also the strength of the different year-classes) as well as the absence of a direct relationship between the abundance of spawners and progeny.

77-000292 Vladimirov, V. I. CRITICAL PERIODS IN THE DEVELOPMENT OF FISHES. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 851-868. 1975. SFA 22(1)

Inst. Hydrobiol. Ukrain Acad. Sci., Kiev, USSR] A concept of the critical periods in the development of fish, put forward for the first time by P. Fabre-Domergue and E. Bietrix is developed. The concept of a critical period introduced into ichthyology by J. Hjort was not sufficiently substantiated and bears no relation to the true critical periods in the development of fishes. It is wrong to identify the critical periods in development with periods of heightened sensitivity, as is frequently done in experimental embryology. Certain moments in early ontogeny, when embryos and larvae with morphological and physiological deficiencies inherited from the parents or acquired during embryonic and early postembryonic development under the influence of unfavorable environmental conditons arrive at a degree of differentiation which prevents their further development and existence (realization of defects), are the critical periods in development. In progeny, developing from high quality sexual products and under favorable environmental conditions, no critical periods are apparent and they must consequently be considered as a population feature and not an individual one. In the early ontogeny of fishes there are several such periods; in different species they may occur at different stages of development. Numerous data are presented on critical periods of development during the larval life of fishes from different families in support of the concept developed.

IDENTIFICATION, KEYS, CLASSIFICATION

77-000293 Andriyashev, A. P. THE SYSTEMATIC POSITION OF /OPHIDIUM PARRII/ FROM THE AMERICAN ARCTIC. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 695-697. 1975. SFA 22(1)

[Zool. Inst., USSR Acad. Sci., Leningrad, USSR] Analysis of the published original sources has led us to the following conclusions: 1) the mysterious specimen of /Ophidium parrii/ described 150 years ago from Baffin Land does not belong to the family Zoarcidae, as was accepted until recently, but is based on one of the local species of the genus /Liparis/ of the family Liparidae; 2) the genera /Uronectes/ and /Lycocara/ are added to the synonymy of the genus /Liparis/, and the species /Lycocara parrii/ is excluded from lists of Arctic fishes.

77-000294 Barsukov, V. V.; Fedorov, V. V. SPECIES OF THE GENUS /HOZUKIUS/ (SCORPAENIDAE, SEBASTINAE) FROM THE GUYOTS OF THE HAWAIIAN SUBMARINE RIDGE. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 869-876. 1975. SFA 22(1)

[Zool. Inst., USSR Acad Sci., Leningrad, USSR] A new species of the formerly monotypic genus /Hozukius/, H. guyotensis/ is described from five specimens 341-503 mm long from the Lyra guyots. The morphological differences from the type species, /H. emblemarius/ (Jordan et Starks, 1904), living off the coast of Japan reveal a certain parallelism with the differences between the species of /Helicolenus/, /H. fedorovi/ and /H. hilgendorfi/ which differ similarly in regard to distribution.

77-000295 Denoncourt, R. F.; Potter, W. A.; Daniels, D. W. A RECORD OF THE WHITE BASS, /MORONE CHRYSOPS/, FROM THE SUSQUEHANNA RIVER. Chesapeake Sci. 17 (4): 304-305. Dec. 1976. SFA 22(1)
[Dep. Biol. Sci., York Coll. Pa., York 17404]

77-000296 Denoncourt, R. F.; Stauffer, J. R., Jr. A TAXONOMIC STUDY OF RECENTLY INTRODUCED POPULATIONS OF THE BANDED DARTER, /ETHEOSTOMA ZONALE/ (COPE), IN THE SUSQUEHANNA RIVER. Chesapeake Sci. 17 (4): 303-304. Dec. 1976. SFA 22(1)
[Dep. Biol. Sci., York Coll. Pa., York 17404]

77-000297 McAllister, D. E.; Aniskowicz, J. VERTEBRAL NUMBER IN NORTH AMERICAN SCULPINS OF THE /MYOXOCEPHALUS QUADRICORNIS/-COMPLEX. J. Fish. Res. Board Can. 33 (12): 2792-2799. Dec. 1976. In English with French summ. SFA 22(1)
[Ichthyol. Unit., Natl. Mus. Nat. Sci., Ottawa, ON K1A 0M8, Canada] X-rays of 438 North American specimens of the /Myoxocephalus quadricornis/-complex (Cottidae) showed mean vertebral counts (including urostyle) of 38.433 in the deepwater sculpin which inhabits inland continental lakes; 41.097 in the freshwater relict in lakes on Victoria Island, Northwest Territories; 41.417 in newly discovered freshwater relicts in Nauyuk, Stanwell-Fletcher, and Sophia lakes, Northwest Territories; and 41.821 in the coastal fourhorn sculpin living in brackish and marine coastal waters and certain adjacent fresh waters. Except for the Victoria and the three lake relicts, the vertebral means of all pairs of these groups differed at /P/ less than .01 or less than .001. Of the coastal fourhorn sculpin and the deepwater sculpin 91 percent are indentifiable using only vertebral number, of the Victoria relict and the deepwater sculpin 68 percent, and of the Victoria relict and the coastal fourhorn only 10 percent. Vertebral counts alone permit recognition of the deepwater sculpin as a subspecies, /Myoxocephalus quadricornis thompsonii/ Girard, 1852, distinct from the arctic coastal fourhorn sculpin provisionally referred to /M. q. hexacornis/ (Richardson, 1823) and suggest classification of the Victoria Island, Nauyuk, Stanwell-Fletcher, and Sophia lake relicts with the coastal form, rather than with the deepwater sculpin. Relicts in the latter three lakes are suggested to be postglacial in origin.

77-000298 Olney, J. E.; Grant, G. C. EARLY PLANKTONIC LARVAE OF THE BLACKCHEEK TONGUEFISH, /SYMPHURUS PLAGIUSA/ (PISCES: CYNOGLOSSIDAE), IN THE LOWER CHESAPEAKE BAY. Chesapeake Sci. 17 (4): 229-237. Dec. 1976. SFA 22(1)
[Planktol. Dep., Va. Inst. Mar. Sci., Gloucester Point 23062] One hundred ninety-four larvae of /Symphurus plagiusa/ were taken in the lower Chesapeake Bay during a three-year zooplankton survey 1971-1974. Early larval stages (1.3-6.2 mm NL) are illustrated and described. Recently hatched larvae (1.3-2.8 mm NL) are distinguished by pigment patterns, gut configuration, and a fleshy occipital hump. Later larvae (2.8-6.2 mm NL) are identified by pigmentation, gut configuration and produced dorsal rays. Larvae were taken during July and/or August each year. Recently hatched larve (1.3-2.9 mm NL) made up the majority of the catch and were most abundant in the deepest and most saline portions of the bay. Large estuaries may be more significant spawning areas for /Symphurus plagiusa/ than previously reported. Evidence is presented that earlier description of /S. plagiusa/ larvae may be in error.

77-000299 Reshetnikov, Yu. S.; Novikov, A. S.; Slugin, I. V.; Shtundyuk, Yu. V.; Postnikov, V. M. THE ROUND WHITEFISH (/PROSOPIUM CYLINDRACEUM/) OF CHUKOTKA. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 710-724. 1975. SFA 22(1)

[A. N. Severtsov Inst. Evol. Morphol. Anim. Ecol., USSR Acad. Sci., Moscow, USSR] A morphometric description is given of the round whitefish (/Prosopium cylindraceum/) of the Anadyr River and the Kolyma river basin. The round whitefish is shown to be comparatively stable monotypic species, by comparison with other coregonids, not forming either subspecies or ecological forms. At the same time the round whitefish of the Anadyr River is found to be more similar in a number of characters to the American round whitefish than to the round whitefish from Asian waters. However, these differences do not provide grounds for distinguishing it as a separate subspecies. The cause of the segregation of the Anadyr round whitefish from the other round whitefishes from Siberia and its similarity to American populations is due to its distributional history.

77-000300 Seshagiri Rao, B. V. SYSTEMATIC STUDIES ON FISHES BELONGING TO THE GENUS /COILIA/ GRAY, 1831. J. Bombay Nat. Hist. Soc. 72 (3): 732-739. Dec. 1975. SFA 22(1)

[Zool. Dep., D.N.R. Coll., Bhimavaram (A.P.), India] There has been considerable confusion in regard to the systematics of species of fishes of the genus /Coilia/ commonly known as rattailed anchovies. Most of the confusion is due to the fact that adequate attention has not been paid to intraspecific variation in numbers of pectoral filaments, scutes and anal fin rays; the latter often misleading due to an artefact resulting out of caudal damage and subsequent regeneration. It is believed that, in all, four species occur in India.

77-000301 Stehmann, M. /BREVIRAJA CAERULEA/ SPEC. NOV. (ELASMOBRANCHII, BATOIDEA, RAJIDAE); EINE NEUE ARCHIBENTHALE ROCHENART UND ZUGLEICH EIN ERSTNACHWEIS IHRER GATTUNG IM NORDOSTATLANTIK. [/BREVIRAJA CAERULEA/ SPEC. NOV. (ELASMOBRANCHII, BATOIDEA, RAJIDAE); A NEW DEEP WATER SKATE AND THE FIRST RECORD OF ITS GENUS IN THE NORTH EAST ATLANTIC.] Arch. Fischereiwiss. 27 (2): 97-114. Nov. 1976. In German with English summ. SFA 22(1)

[Inst. Seefisch. Bundesforschungsonst. Fisch., Hamburg, West Germany] /Breviraja caerulea/, a new deep water skate, represents the first record of the genus in the NE-Atlantic. Its generic identity is varified by characters of the snout skeleton, skull, and clasper. The intensive blue colouration of the dorsal surface separates /Breviraja caerulea/ from its remaining congeners.--From abstr.

77-000302 Trunov, I. A. NOTES ON THE FISH FAUNA OF THE SOUTH-EASTERN ATLANTIC. A NEW SPECIES OF FISH FROM THE FAMILY BATHYCLUPEIDAE. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (6): 998-999. 1975. SFA 22(1)

[AtlantNIRO, Kaliningrad, USSR]

77-000303 Vladykov, V. D.; Kott, E. IS /OKKELBERGIA/ CREASER AND HUBBS, 1922 (PETROMYZONIDAE), A DISTINCT TAXON? Can. J. Zool. 54 (3): 421-425. Mar. 1976. SFA 22(1)

[Dep. Biol., Univ. Ottawa, Ottawa, Ontario, Canada] Published descriptions of /Okkelbergia/ Creaser and Hubbs, 1922 include no characteristics not found in /Lampetra/. Both taxa share the following generic characters: three pairs of inner lateral teeth, typically two supraoral cusps, and lack of posterial teeth. /Okkelbergia/ is considered to be a junior subjective synonym of /Lampetra/ Gray, 1851.

77-000304 Zurbrigg, R. E.; Scott, W. B. /DIAPHUS HUDSONI/ (PISCES: MYCTOPHIDAE), A NEW LANTERNFISH FROM THE SOUTH ATLANTIC OCEAN. Can. J. Zool. 54 (9): 1538-1541. Sept. 1976. In English with French summ. SFA 22(1)

[Kingsway Anim. Hosp., 3265 Bloor St. W., Etobicoke, ON M8X 1E2, Canada] A new myctophid species, /Diaphus hudsoni/, was captured in the South Atlantic Ocean, and is described. It is similar to /Diaphus subtilis/ Nafpaktitis, which occurs in the North Atlantic Ocean, but is definitely distinct with its slender, more numerous gill rakers (total 23-25), and noncontinuous AOp-Prc series. The AO series numbers 5 + 5-6. The holotype is deposited in the Royal Ontario Museum, ROM 27569.

PARASITES AND DISEASES-GENERAL

77-000305 Ellis, A. E.; Munroe, A. L. S.; Roberts, R. J. DEFENCE MECHANISMS IN FISH. 1. A STUDY OF THE PHAGOCYTIC SYSTEM AND THE FATE OF INTRAPERITONEALLY INJECTED PARTICULATE MATERIAL IN THE PLAICE (/PLEURONECTES PLATESSA/ L.). J. Fish. Biol. 8 (1): 67-78. Jan. 1976. SFA 22(1)

[Mar. Lab., Aberdeen, Scotland] The lympho-reticular tissues in the plaice were investigated for their phagocytic properties on colloidal carbon after its intraperitoneal injection. Fish were killed at intervals ranging from 10 min to 25 days after injection. Although peritoneal macrophages constituted a large population of phagocytic cells, most of the carbon apparently gained access to the circulation as free particles and phagocytosis was performed predominantly by the ellipsoids of the spleen, the network of reticulo-endothelian (RE) cells throughout the haemopoietic tissue of the kidney, and by the RE cells occupying intermuscular spaces in the atrium of the heart. The cardiac macrophages rapidly emigrated from the organ while the carbon containing macrophages in the kidney and spleen formed aggregates in the lymphoid areas, either within or outwith pre-existing aggregates of melano-macrophages. The possible significance of phagocyte aggregations, including melano-macrophages, in association with lymphoid elements in the kidney and spleen is discussed in the context of immune mechanisms.

77-000306 Shotter, R. A. THE DISTRIBUTION OF SOME HELMINTH AND COPEPOD PARASITES IN TISSUES OF WHITING, /MERLANGIUS MERLANGUS/ L., FROM MANX WATERS. J. Fish. Biol. 8 (2): 101-117. Feb. 1976. SFA 22(1)

[Dep. Biol. Sci., Ahmadu Bello Univ., N. Cent. State, Zaria, Nigeria] In an examination of 1352 whiting 0-5+ years old from Manx waters it was found that the digeneans /Hemiurus communis/ Odhner and /Derogenes varicus/ Muller were restricted to the stomach. /Stephenostomum pristis/ Looss, /Podocotyle atomon/ Rudolphi and /Lecithaster gibbosus/ Rudolphi were most commonly found in the

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anterior intestine and caeca of mature fish but were found more posteriorly along the intestine of young whiting. The metacercaria of /Cryptocotyle lingua/ Creplin were found predominantly in the skin above the lateral line. The fins contained fewer cysts than expected from the area available. Plerocercoids of /Grillotia erinaceus/ Van Beneden mainly infested the musculature of the pyloric stomach and those in the perivisceral cavity were concentrated in the extreme posterior corner. Unencapsulated forms of the nematode /Contracaecum clavatum/ Rudolphi were commonest in the anterior intestine and stomach. Encapsulated forms were most abundant in the liver. The acanthocephalan /Echinorhynchus gadi/ Rudolphi was usually found in the posterior intestine and its presence further restricted /Contracaecum/ to the anterior intestine. In young whiting over two-thirds of the copepod /Clavella uncinata/ Muller were attached to the operculum and posterior rim but in older whiting the majority were attached to the gill rakers. The first gill arch was the most heavily infested and the middle region of the gill arches contained most parasites. The frequency distributions of most of the helminths described more or less a negative binomial distribution. The frequency distribution of /Contracaecum/ did not conform to either a negative binomial or a Poisson distribution.

77-000307 Snieszko, S. F. HISTORY AND PRESENT STATUS OF FISH DISEASES. J. Wildl. Dis. 11 (4): 446-459. Oct. 1975. SFA 22(1)
[U.S. FWS, East. Fish. Dis. Lab., Rt 1, Box 17A, Kearneysville, WV 25430]

77-000308 Vooren, C. M.; Tracey, D. PARASITES IN TARAKIHI (PISCES: CHEILODACTYLIDAE) FROM THREE AREAS AROUND NEW ZEALAND. N. Z. J. Mar. Freshwater Res. 10 (3): 499-509. Sept. 1976. SFA 22(1)
[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 19-062, Wellington, New Zealand] The parasite faunas of tarakihi /Cheilodactylus macropterus/ (Bloch & Schneider) from East Cape, Tasman Bay, and the Chatham Islands were compared. A total of seven parasite species were found of which four were recorded in tarakihi for the first time. The nematode /Anisakis/ sp. and the copepods /Aethon garricki/ Hewitt and /Clavellodes/ sp. were the commonest parasites. Incidence and intensity of /Anisakis/ sp. were high off the Chatham Islands, moderate off East Cape, and low in Tasman Bay. These differences in infestation were truly regional and were only partially caused by differences in age composition of the fish samples. Intensity of infestation with /Anisakis/ sp. was related to age of fish off the Chatham Islands, but not in the other two areas, and this probably reflects regional differences in the diet of the tarakihi. Incidence of /Clavellodes/ sp. was low in Tasman Bay. This parasite was absent from the other two areas, which either may indicate a true regional difference in the distribution of the parasite or may be caused by differences in the age composition of the samples. Incidence of /Aethon garricki/ was moderate in Tasman Bay and off East Cape, but this parasite did not occur in the Chatham Islands tarakihi. Thus, tarakihi populations from three widely separated areas differed from each other in the incidence and intensity of at least one of the three commonest parasites.--From abstr.

77-000309 Wiles, M. PARASITES OF /FUNDULUS DIAPHANUS/ (LESUEUR) (PISCES: CYPRINODONTIDAE) IN CERTAIN NOVA SCOTIAN FRESHWATERS. Can. J. Zool. 53 (11): 1578-1580. Nov. 1975. In English with French summ. SFA 22(1)

[Dep. Biol., Saint Mary's Univ., Halifax, NS, Canada] Over 90 percent of 829 banded killifish from three Nova Scotian locations were infected with at least one parasitic species. Protozoans, monogeneans, digeneans, cestodes, nematodes, acanthocephalans, and a crustacean and a molluscan species occurred in the fish. All species recovered are reported for the first time from /Fundulus diaphanus/ in Nova Scotia and 12 are new host records. Five of the non-digenean larval genera found were probably accidental parasites.

BACTERIAL DISEASES

77-000310 Bullock, G. L.; Stuckey, H. M.; Herman, R. L.; Smith, C. E. COMPARATIVE SUSCEPTIBILITY OF ATLANTIC SALMON (/SALMO SALAR/) TO THE ENTERIC REDMOUTH BACTERIUM AND /AEROMONAS SALMONICIDA/. J. Wildl. Dis. 12 (3): 376-379. July 1976. SFA 22(1)

[U.S. FWS, East. Fish Dis. Lab., Rt. 1, Box 17A, Kearneysville, WV 25430] The bacterium causing enteric redmouth (ERM) and /Aeromonas salmonicida/ were found to be equally pathogenic for fingerling Atlantic salmon (/Salmo salar/). Injection of 5 x 10^5 cells of ERM or /A. salmonicida/ killed all salmon within 96 h. After a 30 min exposure to water-borne cells of the two test bacteria about one-half of the test salmon died within 14 days. Both ERM and /A. salmonicida/ were transmitted horizontally. Results indicate that efforts should be made to prevent introduction of ERM into watersheds where Atlantic salmon occur.

77-000311 Gilmartin, W. G.; Camp, B. J.; Lewis, D. H. BATH TREATMENT OF CHANNEL CATFISH WITH THREE BROAD-SPECTRUM ANTIBIOTICS. J. Wildl. Dis. 12 (4): 555-559. Oct. 1976. SFA 22(1)

[Naval Undersea Cent. Biomed. Group, Code 402, Undersea Sci. Dep., Code 40, San Diego, CA 92132] Serum drug levels were measured in channel catfish following bath exposure to kanamycin, gentamicin and chloramphenicol. Kanamycin was absorbed at a rate sufficient to attain therapeutic blood levels in several treatment schedules. Therapeutic blood concentrations could not be attained with gentamicin or chloramphenicol following 24 hrs exposure at 80 and 100 ug/ml water concentrations, respectively.

77-000312 Hansen, C. B.; Lingg, A. J. INERT PARTICLE AGGLUTINATION TESTS FOR DETECTION OF ANTIBODY TO ENTERIC REDMOUTH BACTERIUM. J. Fish. Res. Board Can. 33 (12): 2857-2860. Dec. 1976. In English with French summ. SFA 22(1)

[Dep. Immunopathol., Scripps Clinic Med. Inst., La Jolla, CA 92037] Carriers (charcoal particles and latex balls) were sensitized with antigen extracts of enteric redmouth (ERM) bacterium and reacted with serum samples from immunized rabbits and hatchery trout populations. Specificity of the test was evaluated using rabbit antisera prepared against several bacterial fish pathogens. The sensitivity of the test was compared with passive hemagglutination, tube agglutination, and slide agglutination procedures. Preliminary hatchery trials determined the practicality of using these tests under field conditions. The tests were shown to be rapid, reliable, sensitive, and specific serological tools. They would be suitable as supplements to recommended isolation methods in large-scale fish disease inspection

77-000312 CONTINUED
and certification programs.

77-000313 Hastein, T.; Bullock, G. L. AN ACUTE SEPTICAEMIC DISEASE OF BROWN TROUT (/SALMO TRUTTA/) AND ATLANTIC SALMON (/SALMO SALAR/) CAUSED BY A /PASTEURELLA/-LIKE ORGANISM. J. Fish. Biol. 8 (1): 23-26. Jan. 1976. SFA 22(1)
[Natl. Vet. Inst., Postboks 8156, Oslo 1, Norway] Ulcerations of the skin associated with haemorrhagic petechiae of liver and kidneys, were the main signs of disease affecting salmon and brown trout in Norway. A death rate of 15-20 percent was estimated for the 5 month period of mid-March--August, although mortalities occurred throughtout the year. Bacteriological examinations, involving 36 isolates, suggested the causual organism to be a /Pasteurella/ although the DNA homology examination gave a G.C. ratio of 55.6 percent which is high for /Pasteurella/ as a group.

77-000314 McCarthy, D. H. FISH FURUNCULOSIS CAUSED BY /AEROMONAS SALMONICIDA/ VAR. /ACHROMOGENES/. J. Wildl. Dis. 11 (4): 489-493. Oct. 1975. SFA 22(1)
[Minist. Agric. Fish. Food, Fish Dis. Lab., Weymouth, England] An epizootic of sub-acute furunculosis caused by an achromogenic variety of /Aeromonas salmonicida/ is described. Bacteriologic, serologic and virulence characteristics of the isolate are presented.

77-000315 McCarthy, D. H. VIBRIO DISEASE IN EELS. J. Fish. Biol. 8 (4): 317-320. Apr. 1976. J. Fish. Biol.
[Minist. Agric. Fish. Food, Fish. Dis. Lab., Weymouth, Dorset, England] This is a first confirmed report of vibriosis or 'red-pest' from wild eel (/Anguilla anguilla/) stocks in Great Britain. It is postulated that the epizootic was provoked by severe stress resulting from the abnormally high estuarine water temperatures and freshwater flow present in affected rivers at the time. Bacteriological characteristics of the isolate, which was classified as a /Vibrio/ sp., are described.

77-000316 Murchelano, R. A. THE HISTOPATHOLOGY OF FIN ROT DISEASE IN WINTER FLOUNDER FROM THE NEW YORK BIGHT. J. Wildl. Dis. 11 (2): 263-268. Apr. 1975. SFA 22(1)
[NMFS, Middle Atl. Coast. Fish. Cent., Oxford, MD 21654] The histopathology of fin rot disease in winter flounder, /Pseudopleuronectes americanus/, from the New York Bight is described. Fin rot in winter flounder was characterized by progressive loss of portions of the anal and dorsal fins. Microscopic findings included epidermal hyperplasia accompanied by dermal fibrosis, hyperemia, and hemorrhage. Bacteria were not observed /in situ/ and a pronounced leukocytic inflammatory response was not noted.

77-000317 Plumb, J. A.; Grizzle, J. M.; Defigueiredo, J. NECROSIS AND BACTERIAL INFECTION IN CHANNEL CATFISH (/ICTALURUS PUNCTATUS/) FOLLOWING HYPOXIA. J. Wildl. Dis. 12 (2): 247-253. Apr. 1976. SFA 22(1)
[Agric. Exp. Stn., Auburn Univ., Auburn, AL 36860] Apparently sterile lesions developed in the skin and musculature of channel catfish (/Ictalurus punctatus/) six days after fish were severly stressed by an oxygen depletion associated with a phytoplankton die-off in an 8.9 ha pond. Lesions were characterized by hemorrhage and necrosis. /Aeromonas hydrophila/ was isolated from either the lesions or internal organs of all moribund fish necropsied the day after

77-000317 CONTINUED
lesions were first found. As the water quality improved the health of the fish improved. Water quality data collected before and after the oxygen depletion, and associated fish mortality, are presented.

77-000318 Sawyer, E. S. AN OUTBREAK OF MYXOBACTERIAL DISEASE IN COHO SALMON (/ONCORHYNCHUS KISUTCH/) REARED IN A MAINE ESTUARY. J. Wildl. Dis. 12 (4): 575-578. Oct. 1976. SFA 22(1)
[Cent. Res., Univ. Maine, 246 Deering Ave., Portland, 04102] An epizootic of a myxobacterial infection in coho salmon (/Oncorhynchus kisutch/) was responsible for the death of 50,000 fish, 30 percent of the population. Cartilage in the nose, mouth and lower jaw was eroded, and yellow sheets of bacterial growth were observed in the mouth, pharynx and pneumatic duct. The severity of the disease increased with increasing water temperature. Pathogenicity trials were inconclusive; only two of 18 experimentally infected fish succumbed to the disease. However, the lesions, and the absence of other known pathogens suggests the myxobacterium was responsible.

77-000319 Shieh, H. S.; Maclean, J. R. BLOOD CHANGES IN BROOK TROUT INDUCED BY INFECTION WITH /AEROMONAS SALMONICIDA/. J. Wildl. Dis. 12 (1): 77-82. Jan. 1976. SFA 22(1)
[Environ. Can., Fish. Mar. Serv., Halifax Lab., Halifax, NS B3J 2R3, Canada] Furunculosis was induced in brook Trout, /Salvelinus fontinalis/, by experimental inoculation with /Aeromonas salmonicida/. Total protein, Hemoglobin, sialic acid, fatty acids, triglycerides, cholesterol, inorganic-phosphorus, acid-soluble phosphorus, and lipid-phosphorus decreased in the blood of the infected fish while amino acids, urea, total creatinine, ammonia, and glucose increased. Pyruvic acid, lactic acid, and ascorbic acid values showed no significant change.

PROTOZOAN DISEASES

77-000320 Anderson, C. D.; Roberts, R. J.; MacKenzie, K.; McVicar, A. H. THE HEPATO-RENAL SYNDROME IN CULTURED TURBOT (/SCOPHTHALMUS MAXIMUS/ L.). J. Fish. Biol. 8 (4): 331-341. Apr. 1976. SFA 22(1)
[White Fish Auth., Mar. Fish. Cult. Unit, Hunterston, Scotland] The histopathology of biliary hyperplasia and renal calcinosis, associated with infections of two parasites, /Myxidium incurvatum/ and /Rhabdospora thelohani/, is described in turbot, /Scophthalmus maximus/ (L.), from Scottish marine fish farms and wild populations. Liver and kidney lesions were divided into four, and parasite infections into five grades of severity. A few of the fish examined were not parasitized, but every one showed some evidence of pathological change, even the apparently normal individuals from all populations. Although there is a positive association between the parasitic and pathological data, parasitism is not considered to be the principal cause of either the hepatic or renal lesion; the evidence suggests rather a secondary opportunist role for the parasites. The general severity of the condition in captive stocks suggests that the cause may lie in the fundamentals of present techniques of turbot husbandry, but no specific agent has been identified. A case is put forward for considering /Rhabdospora/ to be a parasite rather than a specialized host cell.

77-000321 Arthur, J. R.; Margolis, L. TWO SPECIES OF /MYXOBILATUS/ (MYXOSPORIDA: MYXOBILATIDAE) FROM FRESHWATER FISHES OF WESTERN CANADA, WITH DESCRIPTION OF /M. YUKONENSIS/ SP. NOV. Can. J. Zool. 53 (11): 1663-1668. Nov. 1975. In English with French summ. SFA 22(1)
[Dep. Environ., Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC, Canada] /Myxobilatus yukonensis/ sp. nov. and /Myxobilatus gasterostei/ (Paris, 1912) /Sensu/ S. Shulman, 1953, are described and figured from the kidney tubules and urinary bladder of /Cottus cognatus/ Richardson from Aishihik Lake, Yukon Territory, and /Gasterosteus aculeatus/ Linn from Vancouver Island, British Columbia, respectively.

77-000322 Gill, B. S. ON THE OCCURRENCE OF GANGLIONEUROMA AND CYSTS OF /HENNEGUYA CEHIOCEPHALI/ CHAKRAVARTY 1938 IN A FISH. J. Wildl. Dis. 11 (3): 314-347. July 1975. SFA 22(1)
[Coll. Vet. Sci., Punjab Agric. Univ., Ludhiana, Punjab, India]

77-000323 Hoffman, G. L. WHIRLING DISEASE (/MYXOSOMA CEREBRALIS/): CONTROL WITH ULTRAVIOLET IRRADIATION AND EFFECT ON FISH. J. Wildl. Dis. 11 (4): 505-507. Oct. 1975. SFA 22(1)
[U.S. FWS, Fish Farm. Exp. Stn., P.O. Box 860, Stuttgart, AR 72160] Water contaminated by /Myxosoma cerebralis/ was disinfected with ultraviolet irradition to control whirling disease. Irradiation at 18,000 microwatt seconds/cm² (MWS/cm²) reduced infectivity of /M. cerebralis/ by 31-86 percent and 27,650 MWS/cm² reduced infectivity by 86-100 percent, even in the presence of a small amount of silt.

77-000324 Hubert, W. A.; Warner, M. C. CONTROL OF /EPISTYLIS/ ON CHANNEL CATFISH IN RACEWAYS. J. Wildl. Dis. 11 (2): 241-244. Apr. 1975. SFA 22(1)
[TVA, Muscle Shoals, AL 35660] An /Epistylis/ outbreak occurred on channel catfish in raceways during two growing seasons. Bioassays of potential control chemicals were conducted. Based on the bioassay results, salt (NaCl) plus formalin and salt alone were the most effective treatment chemicals.

77-000325 Khan, R. A. HISTOLOGICAL CHANGES ASSOCIATED WITH TRICHODINID INFECTIONS IN THORNY SKATES, /RAJA RADIATA/ DONOVAN. J. Wildl. Dis. 11 (2): 205-209. Apr. 1975. SFA 22(1)
[Dep. Biol., Memorial Univ., St. John's, NF, Canada] Histological changes in the wall of the copulatory sac of normal adult female thorny skates, /Raja radiata/, were compared with those naturally infected with /Trichodina oviducti/. The parasites were associated with extensive defoliation of the copulatory epithelium and in some instances had penetrated the submucosa resulting in petechiae. An excessive exudate that appeared at the vent was made up of mucus, sloughed cells and parasites. It is speculated that shedding of the copulatory epithelium may be due to a hyaluronidase-like enzyme. Furthermore, the restriction of /T. oviducti/ to adult skates may be dependent on the presence of certain mucopolysaccharides that are very low or absent in immature skates.

77-000326 McArthur, C. P. FIRST ENDOZOIC RECORD OF A TRICHODINID CILIATE IN FISH. N. Z. J. Mar. Freshwater Res. 10 (3): 537-538. Sept. 1976. SFA 22(1)
[Dep. Zool., Univ. Otago, P.O. Box 56, Dunedin, New Zealand] Unidentified trichodinid ciliates (Protozoa: Ciliophora: Urceolariidae) were recorded within the tissues of the New Zealand freshwater eels, /Anguilla australis schmidtii/ (Phillips) and /Anguilla dieffenbachii/ (Gray). Organisms were small, measuring approximately 10 um in diameter, and it is not known how they enter the eels. This is thought to be the first recording of usually ectoparasitic trichodinids occurring within their hosts.

77-000327 Moser, M.; Noble, E. R. THE GENUS /CERATOMYXA/ (PROTOZOA: MYXOSPORIDA) IN MACROURID FISHES. Can. J. Zool. 54 (9): 1535-1537. Sept. 1976. In English with French summ. SFA 22(1)
[Dep. Biol. Sci., Univ. Calif., Santa Barbara 93106] Eight species of /Ceratomyxa/, two new, were found in seven genera and 12 species of macrourids. The constancy in spore size and shape seen in some geographically dispersed species was outstanding.

VIRAL DISEASES

77-000328 Amend, D. F. DETECTION AND TRANSMISSION OF INFECTIOUS HEMATOPOIETIC NECROSIS VIRUS IN RAINBOW TROUT. J. Wildl. Dis. 11 (4): 471-478. Oct. 1975. SFA 22(1)
[U.S.FWS, West. Fish. Dis. Lab., Bldg. 204, Naval Support Activity, Seattle, WA 98115] Detection and transmission of Infectious Hematopoietic Necrosis Virus in rainbow trout (/Salmo gairdneri/) was studied at a commerical trout hatchery. Transmission of virus was demonstrated via water, feed and contaminated eggs. If eggs from carrier females were incubated several weeks in virus-Free water, the resulting fry did not become infected. However, if fry subsequently became infected they were lifetime carriers. Infectious virus was readily detectable in most tissues of moribund fish; in carriers it was detected in sex products of spawning fish, and in samples from the intestine of post-spawning fish, but not in samples from blood, feces, kidney, or liver. The carrier rate was not significantly different between sexes. It was concluded that adult carriers are the reservoir of infection and that transmission occurs primarily when carriers shed virus and expose susceptible fish or eggs.

77-000329 Aneer, G.; Ljungberg, O. LYMPHOCYSTIS DISEASE IN BALTIC HERRING (/CLUPEA HARENGUS/ VAR. /MEMBRAS/ L.). J. Fish. Biol. 8 (5): 345-350. May 1975. SFA 22(1)
[Inst. Zool., Univ. Stockholm, Box 6801, S-113 86, Stockholm, Sweden] Lymphocystis disease has been demonstrated in herring from three different areas of the Baltic Sea. An investigation was made from April 1971-December 1973 in the fishing grounds near the Asko Laboratory. A total of 2629 herrings from randomly selected samples were examined, 14 of which were found to be affected with lymphocystis disease. The relative incidence of the disease varied from 0-2.7 percent in different samples, and was higher in 1972 (1 percent) than in 1971 (less than 0.1 percent). Of 42 diseased herrings with skin lesions 12 also had lesions in internal organs. The lymphocystis cells were usually single in the skin as well as in internal organs, and had a diameter of 1-2 millimetres. They were histologically similar to lymphocystis cells described from other species. Virions with a mean diameter of 300 mm, morphologically similar to earlier descriptions of

77-000329 CONTINUED
lymphocystis virus, were also demonstrated.

77-000330 Murchelano, R. A.; Bridges, D. W. LYMPHOCYSTIS DISEASE IN THE WINTER FLOUNDER, /PSEUDOPLEURONECTES AMERICANUS/. J. Wildl. Dis. 12 (1): 101-103. Jan. 1976. SFA 22(1)
[NMFS, Middle Atl. Coast. Fish. Cent., Oxford, MD 21654] Nodular lesions on the fins of winter flounder, /Pseudopleuronectes americanus/, from Casco Bay, Maine, were identified as lymphocystis disease. Hypertrophied, encapsulated connective tissue cells contained cytoplasmic inclusions composed of icosahedral virus particles. The winter flounder is a new host for lymphocystis disease and is the second flatfish in the western North Atlantic to have the disease.

OTHER DISEASES AND PARASITES

77-000331 Ackman, R. G. VOLATILE KETONES AND ALCOHOLS OF CODWORMS (/TERRANOVA DECIPIENS/) FROM AXENIC CULTURE AND FRESH FISH MUSCLE. J. Fish. Res. Board Can. 33 (12): 2819-2821. Dec. 1976. In English with French summ. SFA 22(1)
[Dep. Environ., Fish. Mar. Serv., Halifax Lab., Halifax, NS B3J 2R3, Canada] Simple techniques for the gas-liquid chromatographic analysis of volatile ketones and alcohols from cultures or native codworm, /Terranova decipiens/, or from the axenic culture medium, are described. Three ketones (propanone-2, butanone-2, pentanone-3) and two alcohols (butanol-2, pentanol-3) were observed. The proportion of alcohols to ketones was different in culture medium and in native worms from cod, but the latter were qualitatively and quantitatively similar in fresh cod taken in March and September.

77-000332 Ball, I. R.; Khan, R. A. ON /MICROPHARYNX PARASITICA/ JAGERSKIOLD, A MARINE PLANARIAN ECTOPARASITIC ON THORNY SKATE, /RAJA RADIATA/ DONOVAN, FROM THE NORTH ATLANTIC OCEAN. J. Fish. Biol. 8 (5): 419-426. May 1976. SFA 22(1)
[Dep. Entomol. Invert. Zool., Royal Ontario Mus., Toronto, ON, Canada] A marine planarian, /Microparynx parasitica/ Jagerskiold, is recorded as an ectoparasite from throny skates, /Raja radiata/ Donovan, trawled off the coast of Newfoundland, Canada. These are the first records of this parasite in the western North Atlantic Ocean. A description of the material is given to facilitate identification of the parasite, together with some biological notes. The asscciation between /Microparynx/ and /Raja/ seems to be a true parasitic one, and not a case of commensalism. /M. murmanica/ Awerinzew is considered to be a junior synonym of /M. parasitica/.

77-000333 Boxshall, G. A. THE HOST SPECIFICITY OF /LEPEOPHTHEIRUS PECTORALIS/ (MULLER, 1776) (COPEPODA: CALIGIDAE). J. Fish. Biol. 8 (3): 255-264. Mar. 1976. SFA 22(1)
[Dep. Zool., British Mus. (Nat. Hist.), Cromwell Rd., London SW7 5BD, England] The host specificity of /Lepeophtheirus pectoralis/ (Muller) was examined experimentally by exposing different fish species to infection by artificially reared copepodid larvae. Copepodids which were hatched from eggs of adults parasitic on plaice (/platessae/ copepodids) preferred plaice to all other fishes tested, whereas copepodids which were hatched from eggs of adults parasitic on flounder (/flesi/ copepodids) preferred flounder to all other fish species. These behavioural differences suggest that two strains of /L. pectoralis/ exist, one (/platessae/) adapted to plaice as its host and

77-000333 CONTINUED
the other (/flesi/) to flounder. Comparison of an experimentally derived order of host preference with a table of occurrence obtained from the literature, suggests that a third strain of /L. pectoralis/, adapted to dab as its host, might also occur. The process of infection by /L. pectoralis/ copepodids is also described. It comprises a host location phase, during which the copepodid enters the habitat of its flatfish hosts and locates host individual, and an attachment phase. The host location phase appears to be governed by changes in the activity of the copepodid and by its positively rheotactic response to water currents produced by the host. The attachment phase is probably based on the response of the copepodid to chemical factors produced by the host.

77-000334 Griffiths, W. E. /HEDRURIS SPINIGERA/ (NEMATODA: SPIRURIDAE) IN STOMACHS OF PERCH /PERCA FLUVIATILIS/ L. N. Z. J. Freshwater Res. 10 (3): 533-536. Sept. 1976. SFA 22(1)
[Fish Wildl. Div., O. S. Longman Bldg., 6909-116 Street, Edmonton, AB T6H 4P2, Canada] High infestations of the nematode /Hedruris spinigera/ were found in stomachs of perch when they had been feeding on smelt /Retropinna retropinna/. When perch fed heavily on smelt, 80 percent carried /Hedruris/, but when this food source was not readily available the infection declined rapidly.

77-000335 Kennedy, C. R.; Lie, S. F. THE DISTRIBUTION AND PATHOGENICITY OF LARVAE OF /EUSTRONGYLIDES/ (NEMATODA) IN BROWN TROUT /SALMO TRUTTA/ L. IN FERNWORTHY RESERVOIR, DEVON. J. Fish. Biol. 8 (4): 293-302. Apr. 1976. SFA 22(1)
[Dep. Biol. Sci., The University, Exeter, England] Infections of brown trout /Salmo trutta/ L. by larvae of the nematode /Eustrongylides/ sp. were studied over a period of two years in Fernworthy Reservoir, Devon. The parasite, here as elsewhere in Britain, is acquired only in the lake itself and not in the streams feeding it. Both native and introduced brown trout were infected but not rainbow trout which did not survive sufficiently long in the reservoir. The parasite showed a preference for female fish and for fish over 20 cm in length. Since these latter were approaching the end of their natural life span in the lake, there was insufficient time for the parasites to accumulate in older fish. No seasonal changes in infection levels or size composition of the parasite population were recorded. The larvae occurred in capsules, the majority of which were attached to the stomach wall. No local pathological effects associated with the capsules were observed and infested fish were of similar length, weight and condition to uninfected ones. The absence of harmful effects upon the trout in Fernworthy Reservoir is compared and contrasted with the effects of the parasite in other localities. It is concluded that although /Eustrongylides/ can occasionally cause damage to some species of fish, there is no conclusive evidence that it does so to trout, but its unsightly appearance and harmful effects on birds renders it an undesirable parasite in any fishery.

77-000336 Ko, R. C. /ECHINOCEPHALUS SINENSIS/ N. SP. (NEMATODA: GNATHOSTOMATIDAE) FROM THE RAY (/AETABATUS FLAGELLUM/) IN HONG KONG, SOUTHERN CHINA. Can. J. Zool. 53 (4): 490-500. Apr. 1975. In English with French summ. SFA 22(1)
[Dep. Zool., Univ. Hong Kong, Hong Kong] Mature and young adults of /Echinocephalus sinensis/ n. sp. are described from the intestine of eagle rays (/Aetabatus flagellum/ Block and Schneider) caught in Deep Bay, Hong Kong. This new species is readily distinguished from the other members of the genus by the number of rows of cephalic spines, presence of cuticularized preoesophageal serrations, length of

77-000336 CONTINUED
spicules, presence of a gubernaculum, and the number and distribution of caudal papillae. Oysters (/Crassostrea gigas/ Thunbert) probably are the intermediate host of this parasite. Seccnd- and third-stage echinocephalid larvae found in these molluscs are described. The taxonomic status of /Echinoccphalus/ is briefly discussed and the generic diagnosis is emended.

77-000337 Lee, R. F. LIPIDS OF PARASITIC COEEPODS ASSOCIATED WITH MARINE FISH. Comp. Biochem. Physiol. B Comp. Biochem. 52 (3): 363-364. Nov. 1975. SFA 22(1)
[Skidaway Inst. Oceanogr., P.O. Box 13687, Savannah, GA 31406]

77-000338 Lubieniecki, B. ASPECTS OF THE BIOLOGY OF THE PLEROCERCOID OF /GRILLOTIA ERINACEUS/ (VAN BENEDEN, 1858) (CESTODA: TRYPANORHYNCHA) IN HADDOCK /MELANOGRAMMUS AEGLEFINUS/ (L.). J. Fish. Biol. 8 (6): 431-439. June 1976. SFA 22(1)
[Sea Fish. Inst., Al. Zjendnoczenia 1, Gdynia,, Poland] From one to thirty /Grillotia erinaceus/ plerocercoids were found in 3714 of 8228 haddock /Melanogrammus aeglefinus/ caught in the northern Ncrth Sea, to the north and west of Scotland and at Faroe. Plerocercoids were also found in 30 of 64 cod from Aberdeen Bay, and in 44 of 55 saithe from the Firth of Clyde. In haddock, most plerocercoids occurred encysted along the intestine, and their freguency fitted a negative binomial distribution. Incidence and intensity of infestaticn increased with host age and there was no host sex difference in incidence. Three maturity stages were recognized, the propcrtions of which were consistent between haddock length groups. No precipitin bands developed in gel diffusion tests using live plerccercoids and sera from infested and uninfested haddock. Attempts to transfer plerocercoids between haddock were unsuccessful. Speculaticns are made on the possible course of the life-cycle.

77-000339 Mahcn, R. EFFECT OF THE CESTODE /LIGULA INTESTINALIS/ ON SPOTTAIL SHINERS, /NOTROPIS HUDSONIUS/. Can. J. Zool. 54 (12): 2227-2229. Dec. 1976. In English with French summ. SFA 22(1)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Ninety six of 292 field-cclleCted /Notropis hudsonius/ were parasitized by the cestode /Ligula intestinalis/. All but two of the infected fish were over 1 year old. Infection sterilized the fish, and heavy infections were associated with poor condition and small size. The parasites were distributed amcng the fish more uniformly than would have been expected by chance.

77-000340 Margolis, L.; Moravec, F.; McDcnald, T. E. /RHABDOCHONA KISUTCHI/ SP. NOV. (NEMATODA: SPIRUROIDEA) FROM COHO SALMCN, /OHCORHYNCHUS KISUTCH/ (WALBAUM), OF WESTERN CANADA. Can. J. Zool. 53 (7): 960-966. July 1975. In English with French summ. SFA 22(1)
[Dep. Environ., Fish. Mar. Serv., Pac. Biol. Stn., Nanaimc, BC, Canada] A new nematode species, /Rhabdochona kisutchi/ sp. nov., is described from the intestine and pyloric caeca of coho salmon (/Oncorhynchus kisutch/) smolts from streams of British Cclumbia, Canada. It differs from all hitherto known members of the genus, except /R. sulaki/ Saidov, 1953, in having eggs provided with polar caps. It can be distinguished from /R. sulaki/ by the shape, origin, and infrequent occurrence of polar filaments; the positicn of the vulva; and the length of the esophagus and female tail.

77-000341 Paperna, I.; Zwerner, D. E. STUDIES OF /ERGASILUS LABRACIS/ KROYER (CYCLOPIDEA: ERGASILIDAE) PARASITIC ON STRIPED BASS, /MORONE SAXATILIS/, FROM THE LOWER CHESAPEAKE BAY. I. DISTRIBUTION, LIFE CYCLE, AND SEASONAL ABUNDANCE. Can. J. Zool. 54 (4): 449-462. Apr. 1976. In English with French summ. SFA 22(1)

[Heinz Steinitz Mar. Biol. Lab., Elat, Israel] Information on the distribution, life cycle, and seasonal abundance of the copepod /Ergasilus labracis/ Kroyer, parasitic on the gills of lower Chesapeake Bay striped bass, /Morone saxatilis (Walbaum), is presented after a 12-month survey. The overall prevalence of /E. labracis/ was 90 percent in all localities sampled and it was found to be as euryhaline as its host; it has been found in salinities from 0.1 1/oo to 32.0°/oo. /E. labracis/ was present and reproductively active throughout the year, suffering only a temporary slowdown in egg production at the beginning of the winter. Peak invasion of striped bass gills by infective larvae occurred during April and May; minor peaks were also recorded during July and October. The free-living stage was estimated to last as long as 6 weeks during early spring. Duration of other developmental stages was also extrapolated. Attempts to rear larvae in the laboratory past the metanauplius stage failed. Larvae could be kept for a maximum of 23 days after hatching if fed nannoplankton and kept at 20°C in river water of 16-18°/oo.

77-000342 Roberts, R. J.; Hill, B. J. STUDIES ON ULCERATIVE DERMAL NECROSIS OF SALMONIDS. V. THE HISTOPATHOLOGY OF THE CONDITION IN BROWN TROUT (/SALMO TRUTTA/ L.). J. Fish. Biol. 8 (1): 89-92. Jan. 1976. SFA 22(1)

[Unit Aquatic Pathobiol., Univ. Stirling, Stirling, Scotland] The clinical signs and histopathological findings of an 'ulcerative dermal necrosis' in brown trout were compared with those observed in salmon and sea trout suffering from UDN. There were close similarities in the lesions shown by both types of fish, but more brown trout recovered and the healing process was temperature dependent.

77-000343 Schwab, M.; Ahuja, M. R.; Anders, F. ELEVATED LEVELS OF LACTATE DEHYDROGENASE IN GENETICALLY CONTROLLED MELANOMA OF XIPHOPHORIN FISH. Comp. Biochem. Physiol. B Comp. Biochem. 54 (1): 197-199. 1976. SFA 22(1)

[Genet. Inst. Justus Liebig-Univ. Giessen Leihgesterner Weg 112-114, 6300 Giessen, West Germany] Premelanomas and melanomas conditioned by the locus /Sd/ on the dorsal fin of Xiphophorin fish showed a several-fold increase in the total LDH activity as compared to the normal counterpart fins. Electrophoretic studies revealed that only B4-isozyme was prominently present in the normal fins, as well as in the premelanomas and the melanomas. The elevated total LDH levels in the premelanomas and the melanomas, as compared to the normal fin, therefore, would appear to represent a higher level of the B4-isozyme.

77-000344 Uhazy, L. S. /PHILOMETROIDES HURONENSIS/ N.SP. (NEMATODA: DRACUNCULOIDEA) OF THE COMMON WHITE SUCKER (/CATOSTOMUS COMMERSONI/) FROM LAKE HURON, ONTARIO. Can. J. Zool. 54 (3): 369-376. Mar. 1976. In English with French summ. SFA 22(1)

[Dep. Zool., Univ. Guelph, Guelph, ON, Canada] A new species of nematode, /Philometroides huronensis/ n.sp., is described from the fins and peritoneum around the swim bladder of the common white sucker (/Catostomus commersoni/). The gravid females and the males of this species are readily distinguishable from those of other members of the genus by the body size, cuticular ornamentation, caudal ventrolateral hypodermal extensions, size and shape of first-stage larva, length of spicules, size and shape of gubernaculum, and location in the host.

77-000344 CONTINUED
Measurements of mature and subgravid females are presented.

POLLUTION

77-000345 Bohn, A.; McElroy, R. O. TRACE METALS (AS, CD, CU, FE, AND ZN) IN ARCTIC COD, /BOREOGADUS SAIDA/, AND SELECTED ZOOPLANKTON FROM STRATHCONA SOUND, NORTHERN BAFFIN ISLAND. J. Fish. Res. Board Can. 33 (12): 2836-2840. Dec. 1976. In English with French summ. SFA 22(1)
[Div. Appl. Biol., B.C. Research, Vancouver, BC V6S 2L2, Canada]
Arctic cod (/Boreogadus saida/) were captured by bottom trawl at depths of 120-300 m. Zooplankton were obtained by bottom to surface tows from the Arctic cod habitat. Average concentrations of arsenic (As) and zinc (Zn) were higher in Artic cod fillets than in livers from the same fish; cadmium (Cd) and iron (Fe) concentrations were higher in livers. The difference between copper (Cu) concentrations in muscle and liver was not significant. As and Zn in whole fish, and As in fillets from seven specimens, were positively correlated to body weight. Cu and Fe in whole fish were negatively correlated to body weight, whereas Cd was not related to body weight. Examination of Arctic cod stomach contents indicated that planktonic copepods were important in the diet. Cd levels were 5-8 times higher in the unsorted copepods than in the Arctic cod, whereas As, Cu, Fe, and Zn were higher in the fish than in the copepods.

77-000346 Cherry, D. S.; Gutherie, R. K.; Rodgers, J. H., Jr.; Cairns, J., Jr.; Dickson, K. L. RESPONSES OF MOSQUITOFISH (/GAMBUSIA AFFINIS/) TO ASH EFFLUENT AND THERMAL STRESS. Trans. Am. Fish. Soc. 105 (6): 686-694. Nov. 1976. SFA 22(1)
[Cent. Environ. Stud., VPI & SU, Blacksburg, VA 24061]
Mosquitofish, the only fish species inhabiting a drainage system that received high coal ash concentration at one end and thermal discharges at the other, appeared to successfully function in this environment with no apparent detrimental effects. Temperature conditions (44.5 C) were more limiting to the speices' functional capacity than was coal ash turbidity (275 JTU) with high metal concentrations. Laboratory preference, avoidance, and lethal temperature trials supported the field observations. Mosquitofish had a final temperature preferendum at 34.7-35.1 C (both individual and group response), an upper temperature avoidance at 39 C when acclimated at 30 and 36 C, and an upper lethal temperature limit at 38 C. The species survived in this aquatic system in which elemental concentrations, determined by neutron activation analysis, were sufficiently high to be lethal to other fish species according to values from the literature and by in situ toxicity tests. Of the 40 elements measured, five (calcium, chlorine, selenium, zinc, and bromine) appeared to be concentrated by the mosquitofish, while the others were most highly accumulated in the benthic sediments.

77-000347 Fediy, S. P. THE EFFECT OF HIGHLY MINERALIZED MINE WATERS ON THE FISH FAUNA OF WATERS IN THE UKRAINIAN STEPPE ZONE. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 847-849. 1975. SFA 22(1)
[Hydrobiol. Res. Inst., Dnepropetrovsk Univ., USSR]

77-000348 Levy, E. M.; Walton, A. HIGH SEAS OIL POLLUTION: PARTICULATE PETROLEUM RESIDUES IN THE NORTH ATLANTIC. J. Fish. Res. Board Can. 33 (12): 2781-2791. Dec. 1976. In English with French summ. SFA 22(1)

[Dep. Environ., Atl. Oceanogr. Lab., Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada] The results of a continuing investigation into the occurrence and distribution of particulate petroleum residues on the surface of the North Atlantic are presented. From 1971 to 1974 more than 580 samples were collected from the North Atlantic on transects between the east coast of Canada and South America, the Caribbean, Baffin Bay and surrounding waters, the Labrador Sea, and the Azores. Repeated sampling was carried out in the Gulf of St. Lawrence and the region between Nova Scotia and Bermuda. The results indicate that the waters north of the Gulf Stream-North Atlantic Current system were virtually free from floating petroleum residues, while the waters of the Gulf Stream, Sargasso Sea, and Caribbean Sea were much more heavily polluted. Although concentrations as high as 91.8 mg/m² were encountered, the general level of pollution was much less with tar contents in southern waters following a lognormal distribution with a geometric mean of 0.16 mg/m². The geographical distribution of tar is interpreted in terms of inputs from shipping and tanker traffic, and surface circulation patterns.

FISH KILLS

77-000349 Hickel, B. FISCHSTERBEN IN EINEM KARPFENTEICH BEI EINER MASSENENTWICKLUNG DES TOXISCHEN PHYTOFLAGELLATEN /PRYMNESIUM PARVUM/ CARTER (HAPTOPHYCEAE). [FISH MORTALITY IN A CARP POND ASSICIATED WITH MASS DEVELOPMENT OF THE TOXIC PHYTOFLAGELLATE /PRYMNESIUM PARVUM/ CARTER (HAPTOPHYCEAE).] Arch. Fischereiwiss. 27 (2): 143-148. Nov. 1976. In German with English summ. SFA 22(1)

[Max-Planck Inst. Limnol., Plon, West Germany] A fish mortality associated with a mass development (4 x 10^2 cells/l) of the nanoplankton flagellate /Prymnesium parvum/ Carter was observed in a carp pond (Fluggerteich) on the island of Fehmarn, FRG, in September 1, 1975. The mortality occurred after the application of copper sulphate (5 g/m³), possibly due to an increased release of the haemolytic exotoxin of /P. parvum/. Nearly 100 percent of the carp population of 4000 and other fish of the pond were killed in one day. The control of /P. parvum/ with copper sulphate was without success in the Fluggerteich. There are only a few reports on fish mortality due to /Prymnesium/ in Central Europe (especially Germany), but /P. parvum/ was a problem in Israeli fish ponds. The mass development of the euryhaline phytoflagellate occurred during an unusually warm weather period. Measures for the control of /P. parvum/ with ammonium are indicated.

TOXICOLOGY; BIOASSAYS

77-000350 Aronson, J. L.; Spiesman, M.; Aronson, A. K. NOTE ON THE DISTRIBUTION OF MERCURY IN FISH SPECIES IN THREE OHIO LAKES. Environ. Pollut. 10 (1): 1-7. Jan. 1976. SFA 22(1)
[Earth Sci. Dept., Case West. Reserve Univ., Cleveland, OH 44106] Mercury was measured for over a hundred fish (sunfish, perch, catfish, white bass and carp) from Fairport Harbour in Lake Erie and from Pymatuning Lake and Mosquito Lake, two large non-industrialised lakes near Lake Erie. All the taxa in the two lakes except carp contain the same low content of mercury, about 0.1 ppm. Carp are distinctly higher at about 0.25 ppm. At Fairport Harbour, carp also contain about 0.25 ppm mercury but, in contrast with the two other lakes, this is not higher than the mercury of the other species, which also contain 0.25-0.35 ppm mercury.

77-000351 Buckley, J. A. ACUTE TOXICITY OF RESIDUAL CHLORINE IN WASTEWATER TO COHO SALMON (/ONCORHYNCHUS KISUTCH/) AND SOME RESULTANT HEMATOLOGIC CHANGES. J. Fish. Res. Board Can. 33 (12): 2854-2856. Dec. 1976. In English with French summ. SFA 22(1)
[Water Qual. Lab., Municipality of Metro. Seattle, Seattle, WA 98104] Juvenile coho salmon (/Oncorhynchus kisutch/) were exposed to treated wastewater containing lethal levels of total residual chlorine (TRCl(2)) with seawater diluent under continuous flow conditions. The 96-h TL50 was 0.07 mg/liter TRCl(2) (4 percent effluent). Exposure resulted in a slight reduction (significant /P/ = .05) in hemoglobin, a slight increase (significant /P/ = .05) in methemoglobin, and a temporary decrease (not significant /P/ = .05) in percentage of circulating immature erythrocytes.

77-000352 Burns, K. A. MICROSOMAL MIXED FUNCTION OXIDASES IN AN ESTUARINE FISH, /FUNDULUS HETEROCLITUS/, AND THEIR INDUCTION AS A RESULT OF ENVIRONMENTAL CONTAMINATION. Comp. Biochem. Physiol. B Comp. Biochem. 53 (4): 443-446. 1976. SFA 22(1)
[Woods Hole Oceanogr. Inst., Woods Hole, MA 32543]

77-000353 Clubb, R. W.; Gaufin, A. R.; Lords, J. L. ACUTE CADMIUM TOXICITY STUDIES UPON NINE SPECIES OF AQUATIC INSECTS. Environ. Res. 9 (3): 332-341. June 1975. SFA 22(1)
[Dep. Biol., Univ. Utah, Salt Lake City 84112] Continuous-flow bioassays were employed to determine 96-hour median tolerance limits (TLm), for the stonefly, /Pteronarcella badia/ (Hagen) (TLm was 18.0 mg Cd/l) and the mayfly, /Ephemerella grandis grandis/ Eaton (TLm was 28.0 mg Cd/l). Ninety-six hours TLm values for other species of aquatic insects tested were not determined, since these species were relatively insensitive to cadmium. Insects exposed for four days in cadmium-containing water, then placed in tap water, show a linear rate of cadmium loss. This loss may lower or prevent mortality under ideal conditions.

77-000354 Clubb, R. W.; Gaufin, A. R.; Lords, J. L. SYNERGISM BETWEEN DISSOLVED OXYGEN AND CADMIUM TOXICITY IN FIVE SPECIES OF AQUATIC INSECTS. Environ. Res. 9 (3): 285-289. June 1975. SFA 22(1)
[Dep. Biol., Univ. Utah, Salt Lake City 84112] Continuous-flow bioassays were employed to determine the relationship between dissolved oxygen and cadmium upon five species of aquatic insects, as measured by survival and the amount of cadmium found within the insect. Results indicate the toxicity of cadmium increases as the dissolved oxygen concentration increases. This may be explained by an observed increase in the amount of cadmium found in the insect as the dissolved oxygen concentration increases. Oxygen consumption has been

77-000354 CONTINUED
reported to increase as the dissolved oxygen concentration increases. In this study, using a fixed cadmium concentration, the amount of cadmium found in the insect also increased with an increase in the dissolved oxygen. Therefore, cadmium absorption may be coupled to metabolism.--From abstr.

77-000355 Daye, P. G.; Garside, E. T. HISTOPATHOLOGIC CHANGES IN SURFICIAL TISSUES OF BROOK TROUT, /SALVELINUS FONTINALIS/ (MITCHILL), EXPOSED TO ACUTE AND CHRONIC LEVELS OF PH. Can. J. Zool. 54 (12): 2140-2155. Dec. 1976. In English with French summ. SFA 22(1)
[Dep. Biol., Dalhousie Univ., Halifax, NS B3H 4J1, Canada]
Fingerling brook trout, /Salvelinus fontinalis/ (Mitchill), were subjected to acute and chronic pH stress for maximum periods of 10,000 min in a series of continuous-flow dilutions of sulphuric acid or sodium hydroxide from pH 2.2 to 10.8 at 10 and 20°C after acclimation at 15°C and pH 6.8. Various tissues, gill, eye, nares, integument, and alimentary tract, were examined histologically and compared with control samples kept at pH 6.8. No differences in the degree or form of tissue injury were detected between series for corresponding pH levels at 10 and 20°C. Thresholds for tissue and cellular derangements were pH 5.2 and 9.0. Mucous cells of gills, nares, and integument exhibited progressive degrees of hypertrophy and excessive secretion of mucus with increased pH stress. Epithelial necrosis and sloughing occurred extensively on gills, corneae, and integument. At the lethal levels (pH 3.5 and 9.8), epithelial necrosis also occurred in the esophagus. No cellular injury was detected in the stomach or any part of the intestine.

77-000356 Daye, P. G.; Garside, E. T. LETHAL LEVELS OF PH FOR BROOK TROUT, /SALVELINUS FONTINALIS/ (MITCHILL). Can. J. Zool. 53 (5): 639-641. May 1975. In English with French summ. SFA 22(1)
[Dep. Biol., Dalhousie Univ., Halifax, NS B3H 4J1, Canada]
Fingerling brook trout, /Salvelinus fontanalis/, (Mitchell), were subjected to acute and chronic pH stress for maximum periods of 10,000 min in a series of dilutions of sulfuric acid or sodium hydroxide at 10 and 20C after acclimation at 15C and pH 6.8. Lethal limits of pH were estimated to be pH 3.5 and 9.8 at both temperatures. There were no observable differences in the resistance times at lethal pH stresses between test temperatures. The order of death was not significant in relation to length or weight of the fish.

77-000357 Fong, W. C. UPTAKE AND RETENTION OF KUWAIT CRUDE OIL AND ITS EFFECTS ON OXYGEN UPTAKE BY THE SOFT-SHELL CLAM, /MYA ARENARIA/. J. Fish. Res. Board Can. 33 (12): 2774-2780. Dec. 1976. In English with French summ. SFA 22(1)
[Dep. Biol., Dalhousie Univ., Halifax, NS, Canada] /Mya arenaria/ gills are capable of removing finely dispersed oil globules of 1-30 um diam from sea water along with food particles. Clams exposed to seawater concentrations of 90-380 ug oil/liter for 10 days at 18 C accumulated oil in their tissues. Concentrations incorporated are directly related to the lipid content of tissues. Approximately 6 mg oil/g lipid was observed within the tissue of individual clams. Respiration rates of small clams (shell length 3.75-4.50 cm) at 18 C are significantly increased after 3 wk of exposure to sea water containing 220-370 ug oil/liter.

77-000358 Gruger, E. H., Jr.; Hruby, T.; Karrick, N. L. SUBLETHAL EFFECTS OF STRUCTURALLY RELATED TETRACHLORO-, PENTACHLORO-, AND HEXACHLOROBIPHENYL ON JUVENILE COHO SALMON. Environ. Sci. Technol. 10 (10): 1033-1037. Oct. 1976. SFA 22(1)

[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112] Four groups of cohorts of juvenile coho salmon (/Oncorhynchus kisutch/) were fed 2,4,2',5'-tetrachlorobiphenyl, 2,4,5,2',5'-pentachlorobiphenyl, and 2,4,5,2',4',5'-hexachlorobiphenyl together at combined total concentrations of 1, 2, and 12 parts per million in food pelets. Salmon fed 12 ppm chlorobiphenyls gained weight significantly (P less than 0.05) faster during a one-month treatment than salmon in a control group. Whole body concentrations of the three chlorobiphenyls in the fish during a 72-day period indicated a possible steady-state condition for the chlorobiphenyls when administered at the concentration of 1 ppm, but not at 2 ppm or greater in the food. Biphenyls chlorinated in the 2,5- and 2,4,5-positions on the aromatic rings were accumulated to a similar extent in the fish. Rearrangement of chlorine atoms from the 2,5-positions to the 3,4-positions in isomeric tetrachlorobiphenyls resulted in an apparent decrease in the accumulation of the compound in young salmon. For the first time a pentachlorobiphenyl was found to cause enhanced activity of the hepatic aryl hydrocarbon hydroxylase system in treated fish.

77-000359 Kinkade, M. L.; Erdman, H. E. THE INFLUENCE OF HARDNESS COMPONENTS (Ca^{2} AND Mg^{2}) IN WATER ON THE UPTAKE AND CONCENTRATION OF CADMIUM IN A SIMULATED FRESHWATER ECOSYSTEM. Environ. Res. 10 (2): 308-313. Oct. 1975. SFA 22(1)

[Dep. Biol., Northeast La. Univ., Monroe 71201] To determine whether hardness components in water influenced uptake and concentration of Cd in members of a simulated freshwater ecosystem, an alga (/Nitella flexilis/), a rooted plant (/Elodea canadensis/), infusoria snails (/Ampullaria paludosa/), catfish (/Corydoras punctatus/), and guppies (/Lebistes reticulatus/) were cultured together for 1, 6, and 12 hr; and 1, 2, 3, 7, 11, 14 and 21 days in hard (total Ca^{2+} and Mg^{2+} approximately 150 ppm) or soft (total Ca^{2+} and Mg^{2+} 0 ppm) water containing an initial concentration of 0.1 ppm Cd-115. At the end of each of the 10 different exposure periods, specimens of each species were rinsed in distilled water, digested in nitric acid, plated on 2-in. stainless steel planchettes and dried. The amount of radioactivity indicated that the initial rate of Cd uptake by these organisms was faster in hard water than in soft water; however, the total concentration of Cd was greater in those organisms cultured in soft water than those in hard water.

77-000360 Lorio, W. J.; Jenkins, J. H.; Huish, M. T. DEPOSITION OF DIELDRIN IN FOUR COMPONENTS OF TWO ARTIFICIAL AQUATIC SYSTEMS AND A FARM POND. Trans. Am. Fish. Soc. 105 (6): 695-699. Nov. 1976. SFA 22(1)

[Miss. State Univ., Res. Cent., Natl. Space Technol. Lab., Bay St. Louis, MS 39520] Studies of deposition of dieldrin concentrations sublethal to fish were conducted in flowing and non-flowing aquatic systems. Residual concentrations were determined for water, soil, Plants, and fish in 18 flowing and 18 static artificial systems, after treatments of 24, 36, 48, and 72 h, in a farm pond. Samples from each of the four components were analyzed for dieldrin residues by gas chromatography. Two aquaria with aerated water but without biological components were tested. The distribution of dieldrin was similar in the waters of the closed, flowing, and farm-pond systems. Soils contained little dieldrin but the compound was accumulated rapidly and as high as 474 ppb (parts per billion) and 3,950 ppb by plants and fish, respectively. The concentration of the insecticide declined with

77-000360 CONTINUED
time in the three systems (soils, plants, and fish).

77-000361 Lunn, C. R.; Toews, D. P.; Pree, D. J. EFFECTS OF THREE PESTICIDES ON RESPIRATION, COUGHING, AND HEART RATES OF RAINBOW TROUT (/SALMO GAIRDNERI/ RICHARDSON). Can. J. Zool. 54 (2): 214-219. Feb. 1976. In English with French summ. SFA 22(1)

[Biol. Dep., Acacia Univ., Wolfville, NS, Canada] Short-term, sublethal changes in respiration, heart, and coughing rates in juvenile rainbow trout (1-1.5 years) exposed tc the organcchlorine pesticides p,p'-DDT (1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane) and HEOD (dieldrin) and the methyl carbamate insecticide carbaryl (1-naphthyl N-methyl carbamate) were monitored at 13 ± 2-C to investigate the effects of these pesticides on fish in fresh water. Sublethal responses to carbaryl and HEOD on physiological parameters were difficult to measure because dosages required tc elicit them resulted in 30 percent tc 60 percent mortality. DDT in various concentrations gave graded sublethal responses, and it is suggested that the coughing response in particular might be useful as a water-quality index. The DDT threshold for the coughing response was between 52 and 140 parts per billion.

77-000362 Matsumura, F.; Doherty, Y. G.; Furukawa, K.; Boush, G. M. INCORPORATION CF ^{203}HG INTO METHYLMERCURY IN FISH LIVER: STUDIES ON BIOCHEMICAL MECHANISMS /IN VITRO/. Environ. Res. 10 (2): 224-235. Oct. 1975. SFA 22(1)

[Dep. Entomol., Univ. Wis., Madison 53706] It was found that livers of all fish species particularly pelagic species studied were capable of transforming mercuric icn into methylmercury /in vitro/. The factors involved in the process of methylmercury formaticn from Hg^{2+} ion in the fish liver were studied. The methylation activities were not destroyed by either heat or uv and visible light irradiation treatments. It was thus concluded that the reaction(s) studied here was not mediated by methylcobalamine. Mersalyl, a SH inhibitor, could, however, atolish most of the methylation reaction.

77-000363 Mazmanidi, N. D.; Kovaleva, G. I. THE EFFECT OF DISSOLVED PETROLEUM PRODUCTS ON SOME OF THE ASPECTS OF CARBOHYDRATE METABOLISM IN FISHES AND INVERTEBRATES. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 811-816. 1975. SFA 22(1)

[Georgian Dep., All-Union Res. Inst. Sea Fish. Oceanogr., Batumi, USSR] Consideration is given in the article tc the symptcms of petroleum toxicosis in mobile aquatic organisms (fishes, their larvae and shrimps), as well as to the alteration of scme of the indicators of carbohydrate metabolism in fishes, muscles and shrimps under conditions of acute, subacute and chronic tcxicity by dissclved petroleum products. It is concluded from the similarity of the reaction of organisms at different phylogenetic levels to the effect of a petroleum toxicity that there may possibly be a single mechanism in the action of dissolved petroleum products cn living structures.

77-000364 McCarty, L. S.; Houston, A. H. EFFECTS OF EXPOSURE TO SUBLETHAL LEVELS OF CADMIUM UPCN WATER-ELECTRCLYTE STATUS IN THE GOLDFISH (/CARASSIUS AURATUS/). J. Fish. Biol. 9 (1): 11-19. July 1976. SFA 22(1)

[Dep. Biol. Sci., Brock Univ., St. Catharines, ON L2S 3A1, Canada] Goldfish were exposed to sublethal levels of cadmium (means of 44.5 and 380 ug Cd^{++}/l) for periods of 25 and 50 days, and their water-electrolyte status evaluated by reference to plasma and muscle levels of sodium, potassium and chloride and muscle water content.

77-000364 CONTINUED
Significant changes in plasma chloride, tissue potassium and tissue water content were observed after 25 days in both test solutions. Specimens held at the more dilute cadmium concentration were apparently able to compensate for most of the initial cadmium effect and, after 50 days exposure, were characterized only by a continuing depression in plasma sodium level. This suggests that the cadmium MATC value for this species under the conditions employed is probably less than 45 ug Cd^{++}/l. Goldfish exposed to 380 ug Cd^{++}/l for 50 days exhibited significant deviations in plasma sodium and chloride levels as well as in tissue sodium and water content, and these parameters may provide useful indices of cadmium effects at sublethal concentrations.

77-000365 McKim, J. M.; Olson, G. F.; Holcombe, G. W.; Hunt, E. P. LONG-TERM EFFECTS OF METHYLMERCURIC CHLORIDE ON THREE GENERATIONS OF BROOK TROUT (/SALVELINUS FONTINALIS/): TOXICITY, ACCUMULATION, DISTRIBUTION, AND ELIMINATION. J. Fish. Res. Board Can. 33 (12): 2726-2739. Dec. 1976. SFA 22(1)
[U.S. EPA, Environ. Res. Lab., Duluth, MN 55804] During a 144-wk period three generations of brook trout (/Salvelinus fontinalis/) were continuously exposed to mean water concentrations of methylmercuric chloride (MMC) of 2.93, 0.93, 0.29, 0.09, 0.03, and less than 0.010 (control) ug Hg/liter. During the first 39 wk the highest concentration produced deformities and 88 percent mortality of first-generation adults. At an MMC concentration of 0.93 ug Hg/liter, second-generation trout developed deformities and all but one female died during the 108-wk exposure. No significant effects on survival, growth, or reproduction of second-generation trout were noted at any of the lower MMC concentrations. No toxic symptoms were observed in the third generation at the three lowest MMC concentrations. The maximum acceptable toxicant concentration (MATC) for brook trout exposed to MMC in this water with a hardness of 45 mg/liter (as CaCO(3)) and a pH of 7.5 fell between 0.93 and 0.29 ug Hg/liter. The mean 96-h LC50 for yearling (200 g) and 20-wk-old (12 g) juvenile brook trout exposed to MMC was 75.0 ug Hg/liter, and the application factor (MATC/96-h LC50) lies between 0.004 and 0.013. The accumulation rate of mercury by eight selected tissues of first-generation trout exposed to MMC was relatively rapid at all MMC concentrations tested. The blood, spleen, and kidney accumulated mercury most rapidly and contained the highest residues in both first- and second-generation trout. There was no significant elimination of mercury from the tissue of first- or second-generation fish, yet a "steady state" (micrograms mercury per gram = constant) was reached in all tissues after 20-28 wk of continuous water exposure. Mean muscle residues in first-generation trout, dying after 16-28 wk of exposure to 2.93 ug Hg/liter and in second-generation trout, dying after 64-100 wk of exposure to 0.93 ug Hg/liter, were 23.5 and 9.5 ug Hg/g, respectively.--From abstr.

77-000366 Niimi, A. J.; LaHam, Q. N. RELATIVE TOXICITY OF ORGANIC AND INORGANIC COMPOUNDS OF SELENIUM TO NEWLY HATCHED ZEBRAFISH (/BRACHYDANIO RERIO/). Can. J. Zool. 54 (4): 501-509. Apr. 1976. In English with French summ. SFA 22(1)
[Minist. Nat. Resour., Whitney Block, Queen's Park, Toronto, ON M7A 1W3, Canada] Newly hatched zebrafish (/Brachydanio rerio/) were exposed to eight compounds of selenium to establish their relative toxicities. The compounds examined included the organoselenides of methionine and cystine, the inorganic selenite salts of sodium and potassium, selenium dioxide, and the inorganic selenate salts of calcium, sodium, and potassium. The selenite compounds were more toxic to zebrafish than the selenates; the 96-h concentrations lethal to 50 percent of the fish ranged from 15 to 23 ug/ml for the selenites and

77-000366 CONTINUED
from 81 to 82 ug/ml for potassium and sodium selenate. The probable role of selenium in the aquatic environment in also examined. The increasing awareness of this potentially significant pollutant, and its antagonistic nature with seven toxic or potentially toxic elements is also noted.--From abstr.

77-000367 Pentreath, R. J. THE ACCUMULATION OF MERCURY FROM FOOD BY THE PLAICE, /PLEURONECTES PLATESSA/ L. J. Exp. Mar. Biol. Ecol. 25 (1): 51-65. 15 Nov. 1976. SFA 22(1)
[Minist. Agric. Fish. Food, Fish. Radiobiol. Lab., Lowestoft, Suffolk, England] The accumulation of inorganic and organic mercury by the plaice has been studied using food species which had acculmulated ^{203}Hg from $^{203}HgCl(2)$- and $CH(3)^{203}HgCl$-labelled sea water, and by the use of labelled pellets. It was found that, in contrast to the inorganic form, methylmercury is readily absorbed and only slowly eliminated. The internal re-distribution of the methylmercury after ingestion was also studied. By using a simplified model of the accumulation of methylmercury from food, the possible concentrations of mercury in fish at different ages have been calculated, both in relation tc some basic physiological factors and to different dietary intakes. The results are discussed in relation to data on mercury levels in the environment.

77-000368 Pentreath, R. J. THE ACCUMULATICN CF MERCURY EY THE THORNBACK RAY, /RAJA CLAVATA/ L. J. Exp. Mar. Biol. Ecol. 25 (2): 131-140. 1 Dec. 1976. SFA 22(1)
[Minist. Agric. Fish. Food, Fish. Radiobicl. Lab., Lowestcft, Suffolk, England] The accumulation of inorganic and organic mercury by the thornback ray has been studied using $^{203}HgCl(2)$ and $CH(3)$ $^{203}HgCl$. Observations have been made on the rates of intake and loss of ^{203}Hg, from both labelled food and sea water, and the internal distributions cf the isotope ccmpared with that of total mercury. Both forms were readily absorbed from sea water. Retention cf the two forms from food was, however, dissimilar in that, in contrast to inorganic mercury, methylmercury was readily absorbed and only slowly eliminated. The results are compared with data on the accumulation of mercury by the plaice.

77-000369 Pentreath, R. J. THE ACCUMULATION OF ORGANIC MERCURY FROM SEA WATER BY THE PLAICE, /PLEURONECTES PLATESSA/ L. J. Exp. Mar. Biol. Ecol. 24 (2): 121-132. 15 Oct. 1976. SFA 22(1)
[Minist. Agric. Fish. Food, Fish. Radiobiol. Lab., Lowestoft, Suffolk, England] The accumulation of organic mercury frcm sea water by plaice eggs, larvae, and adult fish has been studied using $CH(3)$ $^{203}HgCl$ as a tracer. The isotope was rapidly accumulated, the largest fraction being taken up by muscle tissue. High concentration factors were attained by many internal organs, particularly blood, spleen, and kidney. Longer biological half-times than previous estimates with $^{203}HgCl(2)$ were obtained: the possible conseguences of incrganic mercury accumulated from sea water being excreted at the rate for methylmercury have been calculated.

77-000370 Pentreath, R. J. THE ACCUMULATION OF INORGANIC MERCURY FROM SEA WATER BY THE PLAICE, /PLEURONECTES PLATESSA/ L. J. Exp. Mar. Biol. Ecol. 24 (2): 103-119. 15 Oct. 1976. SFA 22(1)

[Minist. Agric. Fish. Food, Fish. Radiobiol. Lab., Lowestoft, Suffolk, England] The accumulation of inorganic mercury from sea water by plaice eggs, larvae, and adult fish has been studied using $^{203}HgCl(2)$ as a tracer. The isotope was rapidly accumulated and the levels of accumulation have been related to stable element concentrations. High concentration factors were attained by many organs, but the distribution of the ^{203}Hg was markedly different from that of the stable element. Whereas the largest fraction of the body burden of mercury is contained by muscle, only a slow rate of accumulation into this tissue was observed. In addition, the mercury in fish muscle is of the methyl form: no evidence for the methylation of the tracer was obtained.

77-000371 Peters, G. B.; Dawson, H. J.; Hrutfiord, B. F.; Whitney, R. R. AQUEOUS LEACHATE FROM WESTERN RED CEDAR: EFFECTS ON SOME AQUATIC ORGANISMS. J. Fish. Res. Board Can. 33 (12): 2703-2709. Dec. 1976. In English with French summ. SFA 22(1)

[Chesapeake Biol. Lab., Solomons, MD 20688] Water-soluble extractives from western red cedar heartwood, bark, and foliage were investigated for their toxicity to aquatic organisms. The heartwood lignans and bark extractives were found to be moderately toxic, but the foliage terpenes and heartwood tropolones were more toxic, causing 50 percent mortality to coho salmon (/Oncorhynchus kisutch/) fry at 0.33 and 2.7 mg/liter, respectively. Tropolones were significantly less toxic to invertebrates than to free-swimming stages of the fish tested. Fry were found to be the stage of development of coho salmon (/O. kisutch/) most sensitive to the tropolones, and eyed eggs the least sensitive. Sensitivity of the coho fry to tropolones was moderated by previous sublethal exposure or the presence of a chelatable cation. Results from field studies and a leaching study indicate that directly releasing cedar leachate from landfills or allowing logging debris to enter streams should be avoided.

77-000372 Pfuderer, P.; Janzen, S.; Rainey, W. T., Jr. THE IDENTIFICATION OF PHTHALIC ACID ESTERS IN THE TISSUES OF CYPRINODONT FISH AND THEIR ACTIVITY AS HEARTRATE DEPRESSORS. Environ. Res. 9 (3): 215-223. June 1975. SFA 22(1)

[Biol. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830] Two substances isolated from carp liver have been identified as dioctyl phthalate and butylbenzyl phthalate. When partially purified from fish liver by two-step column chromatography, these esters exhibited heartrate depressor activity. A pure sample of dioctyl phthalate was not active in the assay, however, while a sample of butylbenzyl phthalate containing 1.5 percent dibutyl phthalate was slightly active, probably due to the dibutyl phthalate it contained. A third phthalate ester, dibutyl phthalate, has also been found in carp liver, in lower concentrations than the other esters, and is a heartrate depressor. Pure samples of dibutyl phthalate remained active at levels of 5 ppm and higher. We are forced to conclude either that traces of a compound which complexes or enhances the activity of dioctyl and butylbenzyl phthalate is responsible for their activity, or that traces of a more active compound are present with them. Dioctyl phthalate was also shown to form complexes in ethanol with fish lipids, presumably with fish di- and triglycerides.

77-000373 Robinson, G. D.; Dunson, W. A.; Wright, J. E.; Mamolito, G. E. DIFFERENCES IN LOW PH TOLERANCE AMONG STRAINS OF BROOK TROUT (/SALVELINUS FONTINALIS/). J. Fish. Biol. 8 (1): 5-17. Jan. 1976. SFA 22(1)

[Dep. Biol., Pa. State Univ., University Park 16802] Survival time of brook trout (/Salvelinus fontinalis/ Mitchill) at low pH was directly related to size, and inversely related to temperature. Between pH 2.50 and 3.25 an increase in pH by increments of 0.25 each led to a 2-3 fold increase in survival time. At higher pH's (3.25-3.75) elevations in pH by the same increments each produced a 3-5 fold increase. Brook trout tested at pH 3.25 and 3.50 showed maximum survival times in June-August. Members of seven inbred lines of brook trout were tested for acid tolerance; the lines differed markedly providing strong evidence that acid tolerance is hereditary. Tests involving either intercrossed or backcrossed offspring of tolerant or intolerant parentals demonstrated intermediate survival in 12.5 percent of all experiments and heterosis in 66.7 percent of the tests. Differences in survival of inbred lines were the most marked at pH 3.25. Exposure for 1 week at pH 3.75 resulted in a 20-25 percent decrease in survival time of 18 fish tested at pH 2.50 and 3.00. Out of a total of 24 trout (17 g) tested at pH 3.75 two highly tolerant individuals were still alive after 6.1 weeks. Thus it is likely that a strain resistant to a pH below 4.1, the previously recorded lower limit, can be developed by selective breeding.

77-000374 Smart, G. THE EFFECT OF AMMONIA EXPOSURE ON GILL STRUCTURE OF THE RAINBOW TROUT (/SALMO GAIRDNERI/). J. Fish. Biol. 8 (6): 471-475. June 1976. SFA 22(1)

[Shearwater Fish Farming Ltd., Low Plains, Armathwaite, Carlisle, Cumbria, England] Gill structure has been studied in fish exposed to various ammonia concentrations. Gill damage resulting from exposure to acutely lethal concentrations was relatively minor and unlikely to have been a primary cause of death. Alternative toxic mechanisms have been discussed. Following long-term exposure to ammonia there were severe histopathological changes in gill structure and oxygen uptake may have been seriously impaired. A high incidence of disease was also observed.

77-000375 Smith, L. L., Jr.; Oseid, D. M.; Olson, L. E. ACUTE AND CHRONIC TOXICITY OF HYDROGEN SULFIDE TO THE FATHEAD MINNOW, /PIMEPHALES PROMELAS/. Environ. Sci. Technol. 10 (6): 565-568. June 1976. SFA 22(1)

[Dep. Entomol. Fish. Wildl., Univ. Minn., St. Paul 55108] Toxic effects of molecular hydrogen sulfide to eggs, fry, and juveniles of the fathead minnow, /Pimephales promelas/ Rafinesque, were determined in flow-through bioassays. The 96-h LC50 of laboratory-cultured juveniles at 20 °C was 0.0243 mg/l. H(2)S. Fry were approximately twice as sensitive. Response with temperature in wild stock juveniles varied from a 96-h LC50 of 0.7754 mg/l. at 6.5 °C to 0.0423 mg/l. H(2)S at 25 °C. In chronic exposure to H(2)S from egg through two generations of laboratory-cultured stock in flow-through bioassays, adverse effects on growth, survival, and fecundity occurred above 0.004 mg/l. H(2)S. Chronic exposure of wild stock up to 346 days caused adverse effects on growth and survival above 0.008 mg/l. H(2)S. At comparable temperatures apparent safe levels with long exposure were five- to sevenfold lower than the 96-h LC50 for both stocks.

77-000376 Sorensen, E. M. B. ULTRASTRUCTURAL CHANGES IN THE HEPATOCYTES OF GREEN SUNFISH, /LEPOMIS CYANELLUS/ RAFINESQUE, EXPOSED TO SOLUTIONS OF SODIUM ARSENATE. J. Fish. Biol. 8 (3): 229-240. Mar. 1976. SFA 22(1)

[Zool. Dep., Univ. Texas, Austin] The rate and level of arsenic accumulation in the liver of green sunfish is greater than that in the other organs examained. The level to which arsenic is concentrated is positively associated with the concentration of arsenic in solution in the immediate environment of a fish, the duration of exposure to arsenic, and water temperature. Since it was found that accumulation causes histopathological changes, a study was made to examine the appearance of and rate of change in hepatocyte ultrastructure morphology following exposure to arsenic concentrations of 0, 30, or 60 ppm and after exposure times of one, two, or three weeks at 20° C. As arsenic concentration and exposure time increased, electron dense particles were observed, and the numbers of intranuclear and cytoplasmic electron dense particles and aberrant mitochondria increased. Also, lysosomes and smooth endoplasmic reticulum increased in number, while the number of myelin figures decreased.

77-000377 Watson, T. A.; McKeown, B. A. THE EFFECT OF SUBLETHAL CONCENTRATIONS OF ZINC ON GROWTH AND PLASMA GLUCOSE LEVELS IN RAINBOW TROUT, /SALMO GAIRDNERI/ (RICHARDSON). J. Wildl. Dis. 12 (2): 263-270. Apr. 1976. SFA 22(1)

[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] The long term effects of three sublethal concentrations of zinc (0.214, 0.52 and 1.12 ppm) on growth and plasma glucose concentration in yearling rainbow trout /Salmo gairdneri/ (Richardson) were investigated. Analysis of covariance of percent weight increase revealed that a significant inhibition of growth (P less than 0.05) in the 1.12 ppm zinc-exposed fish had occurred. Plasma glucose showed a significant hyperglycemia (P less than 0.05) in all three zinc-exposed groups of fish after 7 days exposure and in the 1.12 ppm zinc-exposed group after 63 days. The hyperglycemia observed has been explained as possibly resulting from activation of the pituitary-interrenal axis by the stress of zinc causing mobilization of tissue glycogen.

77-000378 Weis, P.; Weis, J. S. ABNORMAL LOCOMOTION ASSOCIATED WITH SKELETAL MALFORMATIONS IN THE SHEEPSHEAD MINNOW, /CYPRINODON VARIEGATUS/, EXPOSED TO MALATHION. Environ. Res. 12 (2): 196-200. Oct. 1976. SFA 22(1)

[Dep. Anat., Coll. Med. Dent. N. J., Newark 07103] When embryos of /Cyprinodon variegatus/ were exposed to the organophosphate insecticide malathion at concentrations of 3 and 10 parts per million, skeletal malformations developed that were associated with behavioral changes. Fry continued the embryonic convulsive, uncoordinated movements and were therefore unable to swim. Although some of the fry with abnormal movements were morphologically normal, many developed a bent appearance, similar to scoliosis. The severity of the abnormality was greater at the higher concentration of malathion. It is hypothesized that inhibition of acetylcholinesterase was responsible for the abnormal movement of the fry, and that the abnormal movement was responsible for the bent appearance. Malathion at 1 ppm, and DDT or carbaryl at concentrations of up to 10 ppm had no gross effects on embryonic development or hatching of this species.

FISH TOXICANTS

77-000379 Maki, A. W.; Johnson, H. E. EVALUATION OF A TOXICANT ON THE METABOLISM OF MODEL STREAM COMMUNITIES. J. Fish. Res. Board Can. 33 (12): 2740-2746. Dec. 1976. In English with French summ. SFA 22(1)
[Environ. Safety Dep., Procter and Gamble Co., Ivorydale Tech. Cent., Cincinnati, OH 45217] The effects of a toxicant, the lampricide TFM (3-trifluoromethyl-4-nitrophenol), on the metabolism of benthic communities were studied in a series of six indoor model streams resembling typical woodland streams. Each artificially illuminated stream consisted of a 4-m pool section and a 4-m riffle section. A specially developed in situ stream respirometer was used for measurements of net primary production and community respiration in pool and riffle communities. Pretreatment levels of gross primary production ranged during summer, fall, and early winter from 10.7 to 79.0 mg $O(2) \cdot m^{-2} \cdot h^{-1}$ and were supressed by 25-50 percent during exposure to 9.0 mg/liter TFM. Community respiration ranged from 10.5 to 36.2 mg $O(2) \cdot m^{-2} \cdot h^{-1}$ during the same time period and was increased 3-50 percent by the 9.0 mg/liter lampricide treatment. Calculated photosynthesis to respiration (P:R) ratios proved to be sensitive indicators of the influence of the toxicant. The stream communities demonstrated a capacity to adjust to the toxicant influence as evidenced by the rapid return of metabolic rates to pretreatment levels following the exposure period.

RESEARCH AND MANAGEMENT-GENERAL

77-000380 Cope, O. B. (ed.) COLORADO FISHERIES RESEARCH REVIEW 1972-1975. Colo. Div. Wildl. DOW-R-R-F72-75. viii + 104p. Aug. 1976. SFA 22(1)
[Available at $1.50 from Research Cent. Librarian, Colo. Div. Wildl., P.O. Box 2287, Fort Collins 80522]

HABITAT ALTERATION

77-000381 Hinshaw, G. SUCCESS STORY. Colo. Outdoors 25 (6): 29. Nov.-Dec. 1976. SFA 22(1)
[Colo. Div. Wildl., Denver 80216] Aeration Alleviated winter kills in Road Canyon Reservoir, Colorado.--RS

77-000382 Lashnits, D. TENMILE; THE RESURRECTION OF A TROUT STREAM. Colo. Outdoors 25 (6): 24-28. Nov.-Dec. 1976. SFA 22(1)
[Colo. Div. Wildl., Denver 80216]

77-000383 Lee, G. F. DREDGED MATERIAL RESEARCH PROBLEMS AND PROGRESS. Environ. Sci. Technol. 10 (4): 334-338. Apr. 1976. SFA 22(1)
[Univ. Texas, Richardson 75080]

77-000384 Seymour, J. L. PRELIMINARY LEGAL CONSIDERATIONS IN DEVELOPING ARTIFICIAL REEFS. Coast. Zone Manage. J. (copywrite Crane, Russak & Co., N.Y.) 2 (2): 149-169. 1975. SFA 22(1)

[Coll. Bus. Admin., Texas A&M Univ., College Station] Artificial reefs have been shown to be effective for attracting large concentrations of fish to distinct and readily located sites where fishermen are able to increase catches with reduced effort. These man-made reefs, constructed of materials ranging from sunken surplus Liberty ships to worn out tires, may become effective tools in fisheries and coastal zone management programs. There are numerous legal questions which may arise in locating, constructing, and operating these artificial reefs. Liability arising from operation of these reefs will follow general legal doctrines of tort and admiralty. As in most construction and resource development activities, a more-than-generous supply of local, state, and federal regulatory policies and procedures has been provided. Regulatory policies include leasing of sites, construction permits, and marking and lighting of buoys at artificial-reef sites. Protection and consideration of the marine environment and fisheries resources are guaranteed through the application of such laws as the National Environmental Policy Act, the Fish and Wildlife Coordination Act, the Federal Water Pollution Control Act, and the Marine Protection, Research, and Sanctuaries Act. Jurisdiction over construction and operation of these reefs beyond the present territorial sea and contiguous zone may be based on several possible legal regimes.

77-000385 Smith, D. D. NEW FEDERAL REGULATIONS FOR DREDGED AND FILL MATERIAL. Environ. Sci. Technol. 10 (4): 328-333. Apr. 1976. SFA 22(1)

[David D. Smith Assoc., San Diego, CA 92109]

77-000386 Windom, H. L. ENVIRONMENTAL ASPECTS OF DREDGING IN THE COASTAL ZONE. Crit. Rev. Environ. Control 6 (2): 91-109. 1976. SFA 22(1)

[Skidaway Inst. Oceanogr., Savannah, GA] Recent legislation and increased public and scientific awareness have expanded research interest in the environmental impact of dredging. This is particularly true in coastal and estuarine areas, where population and industry are concentrated and the need for construction and maintenance of ship channels is greatest. These areas are also important ecosystems which sustain major marine sports and commercial fisheries. Here research has been focused on the impact of dredging on water quality and biota. Criteria have been established by regulatory agencies for determining the acceptability of dredged spoil disposal to natural waters. These are based on bulk chemical analysis of the sediment to be dredged and have received criticism since observed water quality changes during dredging often do not relate to the sediment chemistry. The most significant water-quality impacts of dredging appear to be due to the creation of turbidity, release of nutrients and, in some cases, oxygen depletion. The greatest impacts on the biota are due to benthic habitat destruction in both the dredging and disposal sites. In some areas these may be irreparable. Other biological impacts are generally transient. If properly conceived, most dredging operations in coastal and estuarine environments can be conducted with minimal impact.

REGULATIONS

77-000387 Andrews, W. P., Jr. NORTH CAROLINA FISHERY LAW: ITS RELATIONSHIP TO INTERNATIONAL, FEDERAL AND SISTER STATE LAW. Crit. Rev. Environ. Control 6 (3): 207-232. 1976. SFA 22(1)
[Attorney-at-Law, Rocky Mount, NC] Since the beginning of recorded history, inhabitants of coastal states have relied on the sea as a source of food, transportation, and economic wealth. As these states became more civilized and began interacting with each other, rules emerged that affected their rights with respect to this vast natural resource. This paper traces the modern historic development of the law used to enforce the right of exploitation of the seas claimed by coastal states in the context of its specific application to North Carolina, and more specifically to the sea as a source of food-fishery law. International law, federal law, state law and their interrelations are all reviewed in an effort to delineate the jurisdictional limitations of each, analyze the actual and potential changes in these jurisdictional limitations, and study what these changes mean to North Carolina fishermen and the United States fishing industry as a whole. The effort is designed to point out the avenues available to North Carolina to more effectively utilize the available regulations to maximize its fishery production. The background information and analysis should be equally applicable to the other coastal states on the Eastern Seaboard.

MARKING AND TAGGING

77-000388 Mears, H. C.; Hatch, R. W. OVERWINTER SURVIVAL OF FINGERLING BROOK TROUT WITH SINGLE AND MULTIPLE FIN CLIPS. Trans. Am. Fish. Soc. 105 (6): 669-674. Nov. 1976. SFA 22(1)
[NMFS, Federal Bldg., 14 Elm Street, Gloucester, MA 01932] In an evaluation of overwinter survival of fin-clipped and unmarked brook trout in a reclaimed pond in Maine, 10,000 fall fingerlings were divided into 20 treatment groups, 19 of which were marked by the removal of either single or multiple fins. Analysis of returns from creel and trap-net sampling indicated that: (1) survival of unmarked, unanesthetized trout was significantly higher than that of marked, anesthetized fish; (2) survival of trout with multiple fin excisions was lower than that of fish with single fin excisions; (3) removal of the adipose fin had little or no effect on survival; and (4) removal of a pectoral fin was no more detrimental than the removal of a ventral fin. Spring recaptures indicated that fish of all groups were equally vulnerable to both sampling methods. Overwinter survival was low for all groups.

77-000389 Morgan, R. I. G.; Roberts, R. J. THE HISTOPATHOLOGY OF SALMON TAGGING. IV. THE EFFECT OF SEVERE EXERCISE ON THE INDUCED TAGGING LESION IN SALMON PARR AT TWO TEMPERATURES. J. Fish. Biol. 8 (4): 289-292. Apr. 1976. SFA 22(1)
[D.A.F.S. Freshwater Fish. Lab., Pitlochry, Perthshire, Scotland] Hatchery reared Atlantic salmon (/Salmo salar/ L.) parr were tagged with the standard I.C.E.S./I.C.N.A.F. salmon tag at water temperatures of 15° C and 6° C. They were then subjected to swimming trials in a tunnel respirometer. Following this treatment the 15° C fish developed necrotic infarcts around the tag insertions. Provided they did not become infected these lesions healed, but if the fish were retested 9 days later, the wound enlarged, became extremely inflamed,

77-000389 CONTINUED
and the fish died soon after. This effect was not seen in 6° C fish.

STOCKING AND INTRODUCTIONS

77-000390 Klein, W. D. STREAM STOCKING: A PROGRAM NOT NEEDED. Colo. Outdoors 25 (6): 32-33. Nov.-Dec. 1976. SFA 22(1)
[Colo. Div. Wildl., Denver 80216] This article is written to encourage those interested in Colorado trout fishing and management to accept the natural productivity of streams and to avoid the expense and artificiality associated with the stocking of creel-size trout into streams with wild trout populations. Most mountain streams in Colorado contain normal self-sustaining populations of wild trout.--From text

FISHING GEAR AND TECHNIQUES

77-000391 Crossland, J. FISH TRAPPING EXPERIMENTS IN NORTHERN NEW ZEALAND WATERS. N. Z. J. Freshwater Res. 10 (3): 511-516. Sept. 1976. SFA 22(1)
[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 19-062, Wellington, New Zealand] Fish trapping experiments were carried out during 1973-75 along the north-east coast of the North Island. The most effective trap type was the Z-trap. Two sizes of Z-trap were tested. Better results were obtained with the larger ones, which had an overall mean catch rate of 8.4 fish/trap day. The catch rate varied widely between areas, bottom types, and seasons. Best results were obtained in summer in depths greater than 20 m.

77-000392 de Jesus, A. S.; Maniulit, A. R. PRELIMINARY REPORT ON THE TRIAL OF BOTTOM TRAWL RIGGED WITH PLASTIC ROLLER BOBBINS AND OVAL BOARD. Philipp. J. Fish. 11 (1-2): 36-50. 1973. SFA 22(1)
[Bur. Fish. Aquatic Resour., Intramuros, Manila 2801, Philippines]

77-000393 Kushnarenko, A. I. THE BEHAVIOR OF JUVENILE FISH AROUND THE WEBBING OF A FINGERLING TRAWL AND IN THE OPERATIONAL ZONE OF THE TRAWL. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 782-790. 1975. SFA 22(1)
[TsNIORKh, Astrakhan, USSR] characteristics of position-finding and defensive reactions in juvenile beluga, Russian sturgeon, sevryuga, wild carp and "Caspian inconnu" are investigated. Consideration is given to the age-related dynamics of the behavior of the juvenile fish, to the dependence of the reaction on the nutritional level of the juveniles, the abundance of fish in the group and the extent of contact between the fishing gear and the bottom. The behavior of juvenile fishes is shown to differ fundamentally and the reactions of fingerlings are shown to be dependent on a number of factors.

77-000394 Pawson, M. G. ANALYSIS OF A NATURAL CHEMICAL ATTRACTANT FOR WHITING /MERLANGIUS MERLANGUS/ L. AND COD /GADUS MORHUA/ L. USING A BEHAVIOURAL BIOASSAY. Comp. Biochem. Physicl. A Comp. Physiol. 56 (2): 129-135. 1977. SFA 22(1)
[Minist. Agric. Fish. Food, Fish Lab., Suffolk, U.K.] Behavioural bioassay for the analysis of active substances in chemical fish attractants is described. Unconditioned responses of cod and whiting to extracts of /Arenicola/ indicated the stimulatory properties of a basic fraction, which contained glycine, serine, alanine, glutamic acid, valine, leucine and threonine. Of these amino acids only glycine and alanine evoked strong responses when tested individually at the concentrations found in /Arenicola/.

MATHEMATICS, STATISTICAL METHODS AND MODELING

77-000395 Blinov, V. V. A POTENTIAL MODEL OF FISH GROWTH. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 15 (5): 764-770. 1975. SFA 22(1)
[VNIRO, Moscow, USSR] Growth equations are given for aquatic animals. Hypotheses of Lagrangian mechanics are used in the derivation of the equations. Some particular solutions are obtained for a simplified equation expressing the linear growth of the organism.

77-000396 Jensen, A. L. TIME SERIES ANALYSIS AND FORECASTING OF ATLANTIC MENHADEN CATCH. Chesapeake Sci. 17 (4): 305-307. Dec. 1976. SFA 22(1)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48104] The autocorrelation structure of menhaden catch data are examined, and a second order autoregressive model is applied for prediction of menhaden catch. The model is useful for year ahead predictions of catch, and the model enables calculation of confidence intervals or error bounds.

77-000397 Jones, D. D.; Walters, C. J. CATASTROPHE THEORY AND FISHERIES REGULATION. J. Fish. Res. Board Can. 33 (12): 2829-2833. Dec. 1976. In English with French summ. SFA 22(1)
[Inst. Anim. Res. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada] Catastrophe theory is a mathematical approach for analyzing systems that show abrupt changes. This paper attempts to apply the theory to fishery development and collapse, where the key variables are assumed to be stock size, level of economic investment or fleet size, and technological efficiency of the fishery gear. The analysis produces no new predictions about uncontrolled development and its consequences, but it appears to provide a useful way of exploring the implications of regulatory policies involving taxation, development subsidies, and technological improvement.

77-000398 Kimura, D. K. ESTIMATING THE TOTAL NUMBER OF MARKED FISH PRESENT IN A CATCH. Trans. Am. Fish. Soc. 105 (6): 664-668. Nov. 1976. SFA 22(1)
[Wash. Dep. Fish., Olympia, WA 98504] The simple ratio estimate of the total number of marked fish present in a catch is described and the variance estimates discussed. A maximum likelihood estimate of the total number of marks present in a catch is derived which combines both marks found in samples and marks voluntarily returned from the non-sampled portion of the catch. The use of this estimate is illustrated with data from the salmon sport fishery in Puget Sound.

RIVER AND STREAM MANAGEMENT & RESEARCH

77-000399 Lennon, R. E. BRINGING BACK THE ATLANTIC SALMON. Natl. Parks Conserv. Mag. 50 (8): 15-19. Aug. 1976. SFA 22(1)
Efforts to restore anadromous runs of Atlantic Salmon (/Salmo salar/) to rivers in the Northeastern United States are reviewed.--BS

MARINE MANAGEMENT & RESEARCH

77-000400 Calvelo, R. R.; Ginoo, J. S. SIGANID FISHERY OF NORTHWESTERN PANGASINAN. Philipp. J. Fish. 12 (1-2): 114-130. 1974. SFA 22(1)
[Bur. Fish. Aquatic Resour., Intramuros, Manila 2801, Philippines]

77-000401 Encina, V. B. THE SET BOTTOM LONGLINE GEAR FOR DEVELOPING THE SPINY DOGFISH SHARK (FAMILY SQUALIDAE) FISHERY IN THE PHILIPPINES. Philipp. J. Fish. 13 (1): 71-101. 1975. SFA 22(1)
[Bur. Fish. Aquatic Resour., Intramuros, Manila 2801, Philippines]
The paper describes the nature of the fishing grounds where the spiny dogfish shark (Family Squalidae) is being exploited. The modification of the drift tuna longline gear into a set bottom longline for exploring the resource in the adjacent waters of Panay Gulf is described. The paper also describes the construction and operation of a new type of set bottom longline for catching the shark in the adjacent waters of Batangas Bay. Previous catch records of the gear is also discussed. A part of the paper mentions the economic values of the shark, and the practice of processing the fish for the local market. The procedure of extracting the liver oil and its quality control for export is also described. The profitability of the fishing venture is estimated side by side with the capital investment and the sales of "crude squalene oil" and other parts of the fish. The conclusion is that dogfish shark fishing is a profitable venture for fishermen.

MISC. TECHNIQUES AND EQUIPMENT

77-000402 Walton, J. M.; Bartoo, N. W. FLATFISH DENSITIES DETERMINED WITH A DIVER-OPERATED FLOUNDER SAMPLER. J. Fish. Res. Board Can. 33 (12): 2834-2836. Dec. 1976. In English with French summ. SFA 22(1)
[U.S. FWS, Wash. Coop. Fish. Res. Unit, Univ. Wash., Seattle 98195]
Densities of four species of flatfish: rock sole (/Lepidopsetta bilineata/), English sole (/Parophrys vetulus/), C-O sole (/Pleuronichthys coenosus/), and the speckled sanddab (/Citharichthys stigmaeus/) were determined by using a flounder sampler designed for use by a scuba diver biologist on sand bottom habitats. Under semicontrolled conditions the overall estimate of flatfish numbers was 91.0 flatfish/1000 m^2 with a 95 precent confidence interval of ± 17.5. Biomass was estimated at approximately 7.4 kg/1000 m^2.

Abdil'dayev, M. A.
77-000263
Ackman, R. G.
77-000331
Adron, J. W.
77-000014
Ahokas, R. A.
77-000043
Ahuja, M. R.
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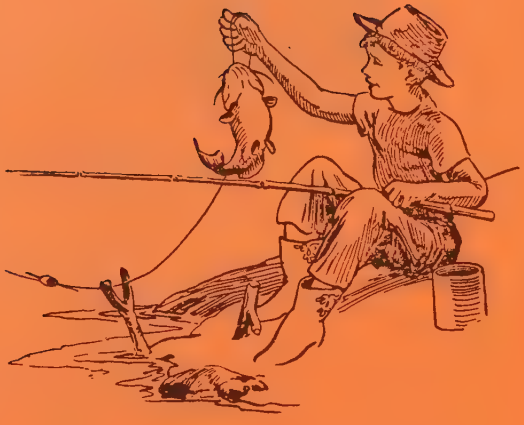

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Atlantic Ocean
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Atlantic Ocean: Africa
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Atlantic Ocean: Baffin Island
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Trematomus bernacchi - Antifreeze Production
77-000158
Trigon pastinaca - Electroreception
77-000044
Vinciguerria nimbaria - Early development
77-000039
Xiphias glaucus - Aggressive Behavior
77-000206
Xiphophoridae - Parasites/Diseases
77-000343
Xiphophoridae - Tumors
77-000343
Zoarces viviparus - Alimentary Tract
77-000040

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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